BULLETIN OF THE

TAYLOR SOCIETY

A SOCIETY TO PROMOTE THE SCIENCE OF MANAGEMENT

Which of these steps, if either, any given industry, or industry as a whole, is going to take nobody can foretell. This much alone is certain; that however accelerated its progress may be, industry will reach its ultimate status by next steps and not by leaps and bounds. On the other hand, those who would wisely guide its next steps should orient themselves by what is ultimately possible. That alone is ordered progress toward a goal; all else is drifting. (Page 9)

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1919

Engineering Societies Building
29 W. Thirty-Ninth St.
New York

OCTOBER, 1919 VOL. IV, No. 5

TAYLOR SOCIETY

ENGINEERING SOCIETIES BUILDING
29 WEST THIRTY-NINTH ST., NEW YORK

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OBJECTS OF THE SOCIETY

(Extract from the Constitution)

The objects of this Society are, through research, discussion, publication and other appropriate means:

1. To secure an understanding and intelligent direction of the principles governing organized effort for the accomplishment of industrial and other social purposes for the mutual benefit of

   A. The Community
   B. Labor
   C. The Manager
   D. The Employer

2. To secure the gradual elimination of unnecessary effort and of unduly burdensome toil in the accomplishment of the work of the world.

3. To promote the scientific study and teaching of the principles governing organized effort, and of the mechanisms of their adaptation and application under varying and changing conditions.

4. To promote general recognition of the fact that the evaluation and application of these principles and mechanisms are the mutual concern of the community, labor, the manager and the employer.

5. To inspire in labor, manager and employer a constant adherence to the highest ethical conception of their individual and collective social responsibility.

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ENGINEERING SOCIETIES BUILDING
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THE members of the Taylor Society are informed of the death, in August, of a fellow-member, Mr. Ernest A. Joseph. In addition to the personal loss to his family and a host of friends, the Clothcraft Shops have lost an able executive and the Taylor Society one of the big young men in scientific management.

COMMENT

THE effort to get this issue into the hands of members at the Boston meeting proved unsuccessful. Circumstances beyond the control of editor and of printers interfered. Also it seems inexpedient to hold the forms for matter relating to that meeting. The papers and discussions will appear in the December issue. It is sufficient to say, for the benefit of those who were unable to be present, that in attendance the meeting was most satisfactory (about 600 participants were present at the principal sessions), and that in the importance of subjects and in earnestness of discussion it was the most significant and altogether successful series of sessions which the Society has ever had. It is conceivable that such meetings may have influence on the industrial trend of the times.

NOT a line of this number should be neglected by readers of THE BULLETIN. The short editorials "Time Study" and "Goodwill" were inspired by the two most significant books on management and administration which have appeared during the year. The editorial by Mr. Avé-Lallemant will help clarify the thinking of those pondering over the relations and significance of the many plans for solving the problem of "industrial democracy." The brief article on "Scientific Management" by Mr. Person and the comprehensive article by Mr. Farquhar—"Positive Contributions of Scientific Management"—should assist readers to a clear understanding of the history of scientific management and of its status at the beginning of the new industrial period following the war. Mr. Hudson's "Cost of Living in Relation to Wage Adjustments" is the description of the methods and results of a noteworthy endeavor to create a mechanism which automatically keeps wages and cost of living in definite relation. Finally, not the least interesting and suggestive reading in this number will be found in the section devoted to "Correspondence."

AT a meeting of the Board of Directors held September 3, committees of the Society were established and appointments made. The Board considered it wise to begin modestly that phase of the active work of the Society represented by committees. Therefore but five major committees were created. Two of these are required by the Constitution (Nominating Committee and Committee on Practice); two are required by administrative problems of the Society (Finance Committee and Membership Committee); one only represents what might be called an operating committee—a committee whose objective is the production of those things, or part of those things, for which the Society exists. It should be remembered, however, that several of these major committees have the power to appoint sub-committees. Therefore those members whose names do not appear in the list below should not yet congratulate themselves that they are immune from service in the front-line trenches during the present stage of operations and that they may enjoy the relative comfort of being in reserve.

THE functions of the first and second of these committees are defined in the Constitution of the Society; the functions of the third and fourth are described by their titles. The function of the Research Committee, however, requires explanation. The title is short for reasons of expediency and is not adequately descriptive. It is not a committee which is intended itself to carry on research. Its function is to plan, arrange for and supervise research carried on by others—sub-committees, individuals, institutions—and to deliver the results of such research to the Managing Director as material for discussion at meetings, for publication in THE BULLETIN, for publication as pamphlets or books, or to be filed in the library of the Society and thereby made available to the members. It should ascertain what experiments and investigations are now being made by members and other willing coöperators and should coördinate these; should arrange for research with respect to those important phases of management which seem to be suffering neglect; and should ascertain where there are results of past investigations on file in the records of individual members, and bring them together and make them available to all members.

IT is hoped that none of the appointees listed below will fail to accept the call to duty. The Society is large enough to make it unnecessary for any particular member to carry the burden of committee membership for long. The present moment is a critical one for the Society, and those who have been summoned to duty have received an honor which is a challenge. To get committee work *started* is the big problem. It seems to be essential to the success of the Society, if the Society is to become a vital factor in the industrial community at a time when the industrial community, as never before within the memory of living men, is in need of such service as this Society can render. There are but two ways of carrying on the work; one is by the creation of a central office with a large enough staff to carry on the work now planned to be carried on through committees—a method which would require the enlargement of our present income to an extent which now seems impracticable; the other is by voluntary, active coöperation of all the members—each carrying a small functional part of the burden—led by a Board of Directors through a modest, efficiently-working central office. Interest which expresses itself in participation in actual work is essential to success. With it one's imagination can see no limit to what the Society may accomplish. There is no other organization which occupies its peculiar field and enjoys its peculiar opportunities in this critical period of industrial development.

THE committees and appointments follow:

Nominating Committee (to nominate candidates for offices of the Society to be elected by letter-ballot during November, in accordance with Article C 23 of the Constitution):

John M. Bruce, *Chairman*
J. A. Bursley,
Henry J. Guild,
Clyde L. King.

Committee on Practice (in accordance with Article C 20 of the Constitution):

Morton C. Tuttle, *Chairman*
Henry H. Farquhar,
Henry L. Gantt,
H. K. Hathaway,
Henry T. Noyes,
J. W. Schulze.
Managing Director, *ex officio*

Finance Committee (concerned with ways and means of securing and the securing of financial support of the Society; with power to appoint sub-committees):

Richard A. Feiss, *Chairman*
F. F. Beall,
E. W. Clarke 3d,
Charles Day,
Henry S. Dennison,
A. L. Filene,
Cecil D. Gregg,
Henry P. Kendall,
Wm. L. Lyall,
J. Franklin McElwain,
George H. Mead.
Managing Director, *ex officio*

Membership Committee (concerned with the problem of increase of membership of the Society; with power to appoint sub-committees):

Keppele Hall, *Chairman*
D. M. Bates,
Winthrop L. Carter,
Wm. R. De Field,
Boyd Fisher,
J. C. Heckman,
Ferdinand M. Holmes,
Victor M. Tyler.
Managing Director, *ex officio*

Research Committee (concerned with the promotion of research in the field of administration and management; with power to appoint sub-committees):

Morris L. Cooke, *Chairman*
L. P. Alford,
George D. Babcock,
Carl G. Barth,
John M. Bruce,
Robert W. Bruère,
J. A. Bursley,
Wallace Clark,
E. St. Elmo Lewis,
Richard Mayo-Smith,
Ida M. Tarbell,
Sanford E. Thompson,
Robert B. Wolf.
Managing Director, *ex officio*

HOLDING BACK ON PRODUCTION

It is undoubtedly true that the characteristic attitude of mind of the rank and file of workers has been and is one of holding back on production. In this they are conscientious. The rank and file believe restriction of production to be a practicable way of attacking the problem of unemployment. Having been taught by employers that a "living wage" is the sum of the just claims of the worker, they have naturally attached great importance to that which makes a living wage possible—employment, and have given the benefit of any doubt in favor of the possible influence of restricted production on employment. They can be excused for failing to think out the ultimate economic effects of such restriction, even on employment. Those among them—their leaders particularly—who are accustomed to think in terms of the larger social consequences may have had some doubt of the wisdom of the policy *as an expression of sound economic principles*; but they have apparently had no doubt of the wisdom of the policy as *a factor in negotiation.* This point of view will be appreciated by every employer who is experienced in negotiation.

That there are individual plants which may be cited as examples of the great benefits to both worker and employer of reasonably unrestricted production is not a sufficient answer to these leaders. Such plants are almost without exception better managed than the average of plants, and the absence of restriction of production is but one aspect of the total of things which make the better management. These are the plants of far-sighted managers; far-sighted in the creation of a true coöperative spirit and of a highly productive technique, and especially far-sighted in giving workers the opportunity to participate in the determination of working conditions and in a just share of increased production. To cite such individual cases is not a satisfactory answer to the leaders of the workers, for the simple reason that the majority of those managers who cite them to support their arguments are not managers who inspire in the leaders confidence in either their intentions or ability to develop such management as to make unrestricted production as advantageous to the workers as it is in the cases cited. The leaders are concerned with the average of managers and the average of management.

Those who have had the privilege of late of discussing current industrial problems with the abler leaders of the workers have come away with a spirit of optimism. They have found them to have purposes and firm in their desire to accomplish those purposes, but they have found them also human and reasonable. Especially so with respect to a developing recognition of the necessity for increased production. Not only the leaders but also the rank and file are conscious of the necessity. There are certain adjustments which they believe should be made, but it can no longer be said that they fail to appreciate the fact that production must be increased. The following words from a letter of the organized employees of Rock Island Arsenal to the Secretary of War are of especial significance: "It has been gratifying to us to note, many times, that the necessity on the part of the men for economical production is well understood. . . . . It is our conviction, more now than ever before, that before long the opportunity will be ripe for us to secure outside talent in the form of competent management engineers and production experts to advise us as workers what we can do to help improve things, what the management can do, and finally what we and the management can do jointly. We are not unaware of our limitations in this respect, and, when the time comes, we hope sincerely that you and the Chief of Ordnance will gladly extend to us the opportunity to have our technical experts coöperate with the Arsenal management and their experts for the purpose of doing everything possible to warrant the fullest utilization of the arsenals as centers of production. The time will be ripe for this as soon as the basic spirit of coöperation and mutual confidence all through the arsenal organizations has been created."

TIME STUDIES

RIDERS to appropriation bills forbidding time studies in arsenals and other government establishments may have led many persons to believe that their use as a mechanism of management may be on the wane in industry. Such is far from being the case. In fact their use has steadily increased and it is probable that there has been too great an increase in attempts—dangerous in their outcome—to establish standards and set rates based on superficial studies made by incompetent persons. The planning and making of time studies, and the computations and the determination of rates based on them, require a degree of engineering knowledge and skill comparable to that required in the designing and drafting rooms. That such engineering competence—the same competence which originally conceived time studies as an industrial mechanism—has been steadily at work and has made the results of its labors available to all managers, is a relief to those concerned with promoting wise administration and the sound and safe utilization of managerial devices.

Merrick's *Time Studies*[1] is a noteworthy contribution to the literature of management. Accepting the distinction between administration and management presented on page 10 of this Bulletin, and excepting works concerned with the philosophy of scientific management, such as Taylor's *Shop Management* and *Principles of Scientific Management,* it may safely be said that this is the most important contribution to the science of management since Taylor's *On the Art of Cutting Metals;* that is, the most important contribution presenting the *results* of the application of the scientific method to the study of detail facts involved in industrial operations for the purpose of establishing standards for exact procedure. It also describes the technique of the scientific method employed,—and proves why the making of time studies and setting of rates should not be left to the inexperienced clerk.

For another reason this book is to be classed with *On the Art of Cutting Metals.* It is a lineal descendent of that book. Mr. Merrick had the good fortune to be associated with Mr. Taylor from 1898 until Mr. Taylor's death in 1915. It was a vision of Mr. Taylor's that there should be and some day would be an encyclopedia of time study data, usable in industry at large, pertaining to every standard machine. Under Mr. Taylor's inspiration and with financial support by him, the studies and the recording of the necessary data was begun. After Mr. Taylor's death the accumulation of data was continued by Mr. Merrick, with the coöperation of other associates of Mr. Taylor, with the result that we now have available what may be called the first volume of the encyclopedia of which the father of scientific management had a vision.

The economic justification of the making of time studies is that they yield dependable knowledge of what a first-class workman can do under given conditions, whereas the casual judgments of even the most experienced foremen and skilled workmen show wide variation. Procedure such as the determination of wage rates, for instance, based upon variable judgments must, to insure profits, make an appreciable allowance for the errors in judgment, always in favor of the party assuming the risk of making the profits. This is natural and is the conscious or unconscious practice in all industry. Wage rates based upon time studies, however, run somewhat higher than those based upon guess, even when other things remain the same, because the allowance for error can be reduced to a minimum. But other things do not remain the same; the precise knowledge yielded by time studies includes knowledge of better working conditions and better procedure which may be brought under precise control, and the result is accretions of certainty from the processes at the machine or bench back through the lay-out of work in the shop to the seasonal lay-out in the production manager's office. The sum total is an increased productivity which may be shared between employer and worker.

The book is divided into three sections: "The first presents the principles, methods and implements of time study; the second is an illustration of time study as applied to a line of machine tools—Gisholt boring mills— together with a series of tables giving the detailed times as established by study; while the final section, in the nature of appendices, includes detailed times for a number of other kinds of work, and thus shows conclusively the wide adaptation of the principles and methods outlined."

Mr. Merrick wisely does not include discussion of the administrative problem of the utilization of time studies. That he may safely leave to others. He contents himself with a straight-forward and complete exposition of the technique of making scientific time studies and of the results of those he has made.

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[1] *Time Studies as a Basis for Rate Setting,* by Dwight V. Merrick, New York, The Engineering Magazine Company, 1919, pp. xiv-366.

FOR YOUR TICKLER

ANNUAL MEETING of the TAYLOR SOCIETY, Engineering Societies Building, 29 W. 39th St., NEW YORK, Friday DECEMBER 5 and Saturday DECEMBER 6, 1919.

Plan to be present; make hotel reservations now

PARTIAL LIST OF CONVENIENT HOTELS

Algonquin,	59 W. 44th	Manhattan,	Madison and 42nd
Astor,	Broadway and 44th	Marlborough,	Broadway and 36th
Belmont,	Park and 42nd	Martinique,	Broadway and 32nd
Biltmore,	Madison and 43rd	Murray Hill,	Park and 42nd
Commodore,	Lexington and 42nd	Pennsylvania,	Seventh and 32nd
Continental,	Broadway and 41st	Ritz-Carlton,	Madison and 46th
Imperial,	Broadway and 31st	Touraine,	9 E. 39th
Iroquois,	49 W. 44th	Vanderbilt,	Park and 34th
Knickerbocker,	Broadway and 42nd	Waldorf-Astoria,	Fifth and 34th
McAlpin,	Broadway and 36th	Woodstock,	127 W. 43rd

TENTATIVE PROGRAM

(details to be announced later)

Friday afternoon	Dec. 5.	Meeting of Committees.
Friday evening	Dec. 5.	Annual Business Meeting.
Saturday forenoon	Dec. 6.	Papers and Discussion: "Standards: Their nature, necessity, use, accomplishments."
Saturday noon	Dec. 6.	Society Luncheon.
Saturday afternoon	Dec. 6.	Papers and Discussion: "Unemployment within Employment."
Saturday evening	Dec. 6.	Society Dinner.
Saturday evening	Dec. 6.	Papers and Discussion: Either "Some Problems of Railroad Management" or "Summary of Papers Given at the Boston Meeting and Continuation of Discussion."

Everyone testifies that the Boston meeting was most stimulating. The official stenographer puts it as well as anyone: "If I may make a comment 'off the record', I don't know when I have reported a more stimulating affair; one where the participants seemed more keen and alive, or where there was more 'ozone' in the atmosphere." Bring your particular brand of ozone to the New York meeting.

Send in at once the names of persons to whom you desire to have notices of this meeting sent.

H. S. Person, Managing Director,
Room 710, 29 W. 39th St., New York.

He sticks strictly to his last, conscious that time study as a managerial mechanism has come to stay, and after a period of vicissitudes such as was experienced by the spinning jenny and the power loom, will become a universally utilized device of industrial management, utilized not merely by capitalistic industry, but also, if there should be such, by coöperative industry.

The most significant parts of the work—because of what they suggest as well as what they specifically present—are Section II and the Appendices. What is specifically presented is a contribution to industry at large, for in these sections are given time study data relating to machines employed in industry at large. Most time studies heretofore published apply to work on particular pieces only—work which may be carried on only in the shop where a study is made; Mr. Merrick's time studies afford information for fundamental operations on the machines studied, usable for all work within the capacity of the machines wherever used. What is suggested is the opportunity which lies open to manufacturers of machines used generally throughout industry. What a contribution they might make to management, how much they might increase productivity wherever their machines are used, if they would time-study the operations of their machines and deliver to the purchasers of them such information concerning their machines as Mr. Merrick here gives concerning Gisholt boring mills!

INDUSTRIAL GOODWILL

IF no other evidence were at hand to demonstrate the importance among administrative problems of the problem of industrial relations, the number of books pertaining to that subject which have come from the press during the past six months approximately would be sufficient. Books do not appear in quantity on a dull market. The majority of those which have appeared are primarily descriptive of efforts which have been made to solve the problem,—chiefly in Great Britain, but also in Canada and the United States. Noteworthy among these are Bloomfield's *Management and Men*, Friedman's *Labor and Reconstruction in Europe*, Kellogg and Gleason's *British Labor and the War*, Lord Leverholme's *The Six Hour Day*, Slichter's *The Turnover of Factory Labor* and Stoddard's *The Shop Committee*. Another group is concerned with the psychological and physiological factors which must be taken account of in any consideration of the problem—Ioteyko's *The Science of Labor*, Lee's *The Human Machine*, Marot's *The Creative Impulse in Industry* and Tead's *Instincts in Industry*. One book constitutes a class by itself. John R. Commons, in *Industrial Goodwill*,[1] synthesizing the conclusions arrived at by the students of special phases of the problem and interpreting them in the light of a labor philosophy of his own, drives an argument straight at the administrator on whom rests the responsibility of taking the initiative in the effort to solve any industrial problem. His objective is the mental attitude of the employer of labor. That once stimulated to a sympathetic perception of existing relations and their consequences in the present state of the industrial arts, mechanisms for giving expression to improved industrial relations will come naturally and easily.

Commons does not argue against the present industrial order. Such argument as there is bearing on this point is opposed to radical change. His address is to the administrator of a regime of private enterprise who aims at profits and who brings together capital, labor and managerial ability for that purpose.

Nor does the author appeal to the humanitarianism of the employer or insist that he should leave the solution of his problem to the "intellectual." "For the proper place of the 'intellectual' or expert, so-called, is that of the *agent* and not that of the *principal*. The principals in industry are the associated employers and the associated employees." "To them (intellectual professional class) a remote future of socialism or syndicalism, when labor shall be supreme, is more impressive than getting along with the foremen or managers in the shop tomorrow and the next day." In contrast to an appeal to humanitarianism the author appeals to the desire for security, "—security not for a few but for all. The employer, or association of employers, or nation of employers, that sets its engineers, accountants, statisticians, scientific managers, along with labor organizations and shop committees, to work out the problem of security of employment, or at least security of earnings, is rescuing capitalism at the point where it stands most in need of goodwill."

Security is to be promoted by preservation of the collective activity which has been developed on behalf of employers, by fostering the collective activity which is developing on behalf of employees, and by bringing the two together into an harmonious super-collective activity. Clashing of desires and of wills, as between collective employers and collective employees, is an expression of human nature and cannot be done away with any more than clashing of desires and of wills between individuals of the employer group has been eliminated; but there may be developed a "reciprocity of will" as between employers and employees just as such a reciprocity has been developed between competing employers. And as conflicts between employers are adjusted as they arise, because the will to do so and the necessary mechanisms exist, so conflicts between groups may be adjusted as they arise, *provided the will to do so, reciprocal recognition of each other's interests and the mechanisms exist.* The argument of the author is that it is to the self-interest of employer to manifest such a will, promote such reciprocal recognition of interests and coöperate to set up the necessary machinery to give effect to the will.

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[1] *Industrial Goodwill*, by John R. Commons, New York, McGraw-Hill Book Co., 1919, pp. 213.

If the security does not arise from elimination of conflict of interests, from what does it arise? From a goodwill which, first, reduces the conflicts to a minimum, second, changes the nature of carrying on those which remain by substituting reasonable negotiation for violence, idle plants and unemployment, and, third, is in itself a will to coöperate, so essential to the most efficient technical working of the procedures required in group operations. Goodwill is "not necessarily a virtuous will or loving will" and the loyalty which accompanies it is "not gratitude for past favors nor a sense of obligation;" goodwill is rather "a beneficial reciprocity of wills" and the loyalty "an expectation of reciprocity." The relations between manufacturer, merchant and banker show goodwill—which is not based on love; and loyalty—which is not based on gratitude; they are based on coöperation for adequate expression of which there exists an adequate machinery. Likewise in the relations between employer and employee, there may be such goodwill and such loyalty, provided there is adequate machinery for its expression.

The machinery, Commons says, must be collective bargaining, for the reason that the goodwill which is the subject of the book is collective goodwill, a goodwill which is different from the goodwill existing between employer and individual employee. A superintendent may greet a worker with a hearty "Good morning, Joe," and receive an equally hearty "Good morning, John,"—greetings expressing a genuine personal goodwill as between the two; but in the conversations between Joe and his fellow workers there may be, and in the present state of the industrial arts is likely to be, expression of a feeling that all is not right as between the management represented by John and the worker represented by Joe. Group consciousness comes in. The unsatisfactory conditions may not be attributed by the workers to John or to any individual in the management, but to the system which has not adjusted itself to the complex conditions of modern-day industry. Therefore there may be a group ill will which neutralizes individual goodwill. This ill will may be changed to goodwill by recognition of the workers' group consciousness through collective bargaining and through supplementary mechanisms such as joint councils and shop committees.

In the literature of industrial relations there is no book more worth the serious attention of administrators and managers.

Certain parts of the book are of especial interest to students of scientific management. What Commons understands of scientific management is difficult to indicate; there are references to it on at least a score of pages. Commons' view is perhaps best indicated by his analysis of the various theories of labor. He first calls attention to the "commodity theory," the theory of the "merchant" to whom labor is a commodity as impersonal as any other material to be purchased in the cheapest market. Then he calls attention to the "machinery theory," the theory of the "engineer" who says that what is bought and sold is not labor but the product of labor, and to whom a laborer is a machine to be valued according to his output and is an operating mechanism to be economized. This he believes to be the theory of scientific management. Finally he presents the goodwill theory, which accepts elements of the commodity and machinery theories, but insists that those theories are incomplete because they do not take cognizance of the collective goodwill of labor as a productive agent.

Commons believes that the beginnings of scientific management go back to efforts of twenty years ago to get away from the cutting of piece-rates.

> Piece-rates *must be cut*, sooner or later, or else either industry will stagnate, or wage-earners will get all of the gains from improvements and none will go to the consumer and the employer . . . . Piece-rate cutting is universal. What is meant when it is denied is perhaps that the cutting is not done *arbitrarily* . . . . Twenty years ago many varieties of premium or bonus systems of paying wages began to be invented by engineers in order to abolish automatically the arbitrary cutting of piece-rates . . . . The early industrial psychologists . . . endeavored to find a plan by which to lesson the temptation of the employer to cut the piece-rate. This psychology turned out to be misdirected . . . . The temptation to cut the rate did not *reside* in

> the bonus but in the task . . . . The essential thing is the *base rate* which determines the task. Here is where scientific management came in. Mr. Frederick Taylor made the next great step in advance. He directed his attention to the task or base rate which should be required before the premium or bonus could begin . . . . Taylor's great contribution. . . . was that of accurately *measuring* the *task* in advance, instead of leaving it to the hit-or-miss, cut-and-dried methods of the old style piece-work practice. Scientific management, applied to labor, is scientific measurement of the laborer's task required to hold the job. . . . . The first practical application of this important distinction between the task and the bonus or premium was that of taking the authority to make the piece-rate away from the foreman and placing it in the hands of . . . . experts, inventors, investigators. They can study waste motions and short cuts. They can standardize the job . . . . can employ the accurate methods of measurement which distinguish science and engineering from rule-of-thumb . . . . set up specifications for the foreman and workmen to follow . . . can study each workman and select those who are fitted to each job . . . This I call the machinery theory of labor.[1]
>
> The application of this theory by the engineer is perhaps the most productive invention in the history of modern industry . . . . But machinery and factory organization are continually approaching a limit of diminishing returns. This limit turns attention to the human factor, and it needs only a candid attention to the experiments of scientific management to become convinced of the large resources and unused possibilities within the human animal which can be developed when once his motions and energies are studied and measured as the engineer studies and measures the other forces and materials used in production (and) the science of industrial psychology is added to the mechanical and biological sciences. . . .[2]

The intellectual ability manifested in this analysis cannot be denied. Nor can one fail to acknowledge the validity of much of the interpretation. It cannot be refuted by those who have not investigated scientific management in operation and are acquainted only with what the books say about it. For the literature does emphasize the mechanics and not the human element in scientific management. It is on the whole concerned with the technique of management and not with the administrative problems involved in the use of the technique. But that does not change the fact that the scientific management practitioners have been and are in the fore of those working for better industrial relations and for the establishment of goodwill and a machinery for its expression. And just as we advise the engineer to read and ponder over Commons' book, we also advise Commons to study scientific management *in operation.*

NEXT STEPS AND ULTIMATES IN INDUSTRY

I.

IN his message of May 20, 1919, President Wilson declared for "the genuine democratization of industry, based upon a full recognition of the right of those who work, in whatever rank, to participate in some organic way in every decision which directly effects their welfare in the part they are to play in industry". The railwaymen's Brotherhoods, in the Plumb Plan, have proposed the "organic way" that is acceptable to them. Again, only about a year ago, the National War Labor Board "recognized and affirmed," in the statement of its principles and policies and in its awards and recommendations, "the right of workers to organize in trade unions and to bargain collectively through elected representatives." Since the Board declared that an employer should not be compelled to recognize and deal with trade unions unless he had done so prior to our entry into the war but should continue such relations if he had, the "shop committees" which the Board ordered set up or recommended became acceptable to many employers who would have resisted their introduction if this had entailed recognition of and dealing with the men's unions. For while the war and the experience it brought have made a difference in the attitude of American employers toward collective bargaining, their attitude toward not only the trade unions as they now exist but toward trade unionism as such has not changed much, if at all. It may be noted that the first national industrial council set up in this country applies to an industry—the ready-made clothing manufacturing trade—which has for some years been a closed union-shop industry and has been operated under trade agreements, in the New York market the so-called "Protocol," regionally applicable. In this industry, therefore, the shop committees are trade-union shop committees; the employer has no voice in the making of the constitution and rules that govern them and there is no covenant under which joint meetings are held. On the other hand, the shop committees set up upon the initiative of employers are designed as joint bodies representative of both employers and employed. This principle is not always fully and clearly carried out in the constitutional arrangements, but implicitly at least, always underlies the organization. While trade-union shop committees, in their main intent and in their function, are "bargaining committees," these new shop and works councils promoted by employers, though also bargaining committees, are more than that, having an avowedly coöperative and constructive purpose. They serve also, and are expected to serve, toward an increase of production and the establishment and maintenance of harmonious relations between employer and employed.

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[1] Ch. II

[2] Ch. III

Now, the American Federation of Labor has declared itself opposed to the shop committees promoted by employers. It has also passed a resolution in favor of, and has since launched, a nation-wide drive for the unionization of the iron and steel industry, in which the majority of these shop committees are found. On the other hand, the Metal Trades Department of the American Federation of Labor, has entered into a trade agreement with the Bethlehem Shipbuilding Corporation (five yards) and the American Shipbuilding Company (eight yards) under which the constitution and the functioning of the works committees in the yards of these corporations are approved and supervised by a joint body consisting of an equal number of representatives of each of the parties to the agreement.

What is novel in the new form of workshop organization is not its representative character as democratic—for the trade-union shop committees in closed union shops are representative and in so far democratic. What is novel is that the employees' representatives constitute merely one side of a joint body in which the employer is also represented by a smaller or equal number of appointed representatives. This difference in organization represents, of course, as it is designed to serve, a different aim and purpose, namely the performance of coöperative and constructive functions.

Whether the function of collective bargaining and these coöperative and constructive activities can be performed by a single body, even if that body is jointly constituted and even if it is sanctioned and supervised by trade unions and employers' associations, is a question which experience alone can decide finally. In the meantime, a critical analysis of the question into its elements, supported by such experience as can be adduced, may cast some light ahead on the road which experience itself must follow.

II.

We have long been familiar with two main forms of industry, in both of which ownership and control ultimately inhere in the same person or persons, that is: (1) *private ownership and private control and operation;* (2) *public ownership and public control with government operation.* With the development of the joint stock company there has grown up an increasing distinction between the owners of industry, either as shareholders or as bondholders, and those who manage or operate it. Under public ownership, the number of owners being equal to that of all the citizens of the respective community, whether city, state or nation, the direct control and the operation of utilities likewise rests with a few, that is the Government and its appointees. The ultimate control in both cases remains, of course, with the owners, that is stockholders and citizens respectively. The chief difference between the two systems, from which ultimately all other differences derive, is that stockholders and boards of directors under private ownership and operation are commonly more mindful of their interests and duties than are citizens and governmental agencies.

A third form of industry, better known in Europe than in this country, we find in the coöperative societies, which represent a system of private ownership and private control and operation that differs from the ordinary system of privately owned and controlled enterprise in so far as each shareholder has only one vote, no matter what his holdings may be, while the members at large, holding no stock, are also represented on the governing board of the society and share in the profits from the business. We have, therefore, in the coöperative society, a partial separation between ownership and control which does not appear under the other two systems already noted.

Now, the war has made us familiar with a more thorough-going separation of ownership and control in two forms, namely: (1) *private ownership and government control and operation,* as with the railroads, the merchant marine, the telegraph and cable system and numerous controlled establishments in industries engaged upon war work; and (2) *joint private and public ownership and joint private and public control and operation,* as in the "consortium" established or proposed for establishment in some European countries, especially France and Germany.

Here and there we have had, even in this country, and some persons now propose with respect to the railways, *public ownership and private (capitalistic) control and operation,* as where public utilities and services have been operated by private persons upon lease or concession. This differs, of course, very little from private contracts upon public works.

All radical proposals for changes in industry can be very directly compared with the systems already described. As most closely related to the system of unrestricted individualism or private ownership and control and operation we have Syndicalism, that is *trade-union ownership and trade-union control and operation.* The elimination of all forms of government except the government by the trade or occupational union, which consistent Syndicalism demands, makes it akin to anarchism, both being ultimately individualistic, though both claim that they are not—and in their intent they need not be—anti-social. The Syndicalist promises a better social system by distributing ownership, but he limits the distribution to less than the whole community, confining ownership of an industry to those who are directly concerned in operating it, that is the crafts concerned. This is only the converse of our present capitalistic system, with this important difference, that while Syndicalism proposes to eliminate from ownership all who do not render service, whether as managers or as operatives, Capitalism, in the joint stock company, has extended both ownership and ultimate control to more shareholders, while at the same time it has called forth the development of a specialized class which is directly concerned with management and only secondarily and accidentally, if at all, with ownership.

Taking half its social philosophy from State Socialism or Collectivism, which demands not only government ownership but government control and operation, and half from Syndicalism, which as we have seen proposes to vest both ownership and control and operation in the trade union, the school of Guild Socialists, or National Guildsmen as they prefer to call themselves in Great Britain, proposes a compromise system, namely, *public ownership and trade-union control and operation.* This is a program with which, in its essentials, the Plumb Plan of the railwaymen's Brotherhoods is identical. But while under the pure Guild Socialist plan the state has no share whatever in the operation of the properties after having leased them to the respective operating guilds, exercising its over-riding control in the public interest solely through its taxing power, the Plumb Plan provides a further guarantee through the participation by the Government in the operation of the properties. It does so by alloting to the Government one-third of the membership of the board of directors. For the exercise of the taxing power the Plumb Plan substitutes, as equivalent, the exercise of the rate-making power by the Interstate Commerce Commission.

Another form under which industry may be carried on, again little known and still less practiced in this country though successfully tried in France and Italy, offers decided advantages, especially for the transition period during which any given industry must pass before it and the public mind are ready for the application of more radical rearrangements. This is the system of the collective contract. This system also takes various of its constituent elements from the other systems already in use in industrial enterprises to-day. In the first place, it does not touch ownership. A "collective contract" can be made with private owners, with the government as representative of the public as owner, with coöperative distributive societies, or with coöperative producers' societies, in fact with any legal person capable of making a contract. From privately controlled industry the system borrows the system of group payment for work done, since for any particular job the contract price goes to the "contract fellowship" of all the workers engaged upon that particular job. Properly to safeguard the bargaining power of the workers, the system may borrow either from the present system of shop and works committees and from the system of trade-union control of the shop. For it will seem advisable to the workers, and in certain handicrafts such as the building trades imperative, to make the "contract fellowship" co-extensive with all or at least the majority of the followers of the craft, in other words, to take in all who are potentially fellows on a given contract. That would mean an inclusion of all the employees in a factory department or in the entire plant or all the trademen in the locality. The shop or works committee, or the trade union, functioning as "contract fellowship," would then become the sole medium of contract between the firm and the workers. Individual contracts, already restricted where their terms are stipulated in advance through trade agreements, would disappear; collective contracts, their terms and the observance thereof similarly stipulated and supervised under the provision of trade agreements, would supplant them.

Which of these steps, if either, any given industry, or industry as a whole, is going to take nobody can foretell. This much alone is certain; that however accelerated its progress may be, industry will reach its ultimate status by next steps and not by leaps and bounds. On the other hand, those who would wisely guide its next steps should orient themselves by what is ultimately possible. That alone is ordered progress toward a goal; all else is drifting.

T. M. Ave-Lallemant[1]

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[1] Recently with the National Industrial Conference Board.

SCIENTIFIC MANAGEMENT[1]

NEW BRIEF STATEMENT OF ITS NATURE AND HISTORY

By H. S. Person[2]

Definition

THE term *scientific management* characterizes that form of organization and procedure in purposive collective effort which rests on principles or laws derived by the process of scientific investigation and analysis, instead of on tradition or on policies determined empirically and casually by the process of trial and error. The principal phases of scientific management are: (1) Exhaustive investigation of the elements usable in collective effort—manual and machine processes, materials, tools and equipment, physical and psychological operating conditions—and their reactions in all possible relations, in order to determine the combination which for any specific purpose is most economical in technical energy—human and material; the formulation of the results of such investigation in principles and laws and the establishment on the basis of such principles and laws of standards of procedure and result; (2) the development and maintenance of such precise and automatic coördination and control of the collective effort as to accomplish, in accordance with the established standards of procedure and result, with economy of energy and time, any purpose of the collective effort; (3) organization of the personnel, processes, materials and equipment in such functional coöperative relation as to bring to bear in the collective effort the highest available and developable technical skill in planning, supervision and execution.

A clear understanding of scientific management requires that management be not confused with administration. Management characterizes the organization and procedure through which collective effort is effected; administration characterizes those considerations and decisions which establish the purposes which create the need for management and those broad governing policies under which the management proceeds. Whether a railroad shall expend capital in further development of a main line for better service or in the acquisition of feeders for larger traffic, whether a manufacturer shall distribute through the established trade channels or through branches and stores established by himself, whether a department store shall sell trade mark merchandise or private brand merchandise, whether any institution shall operate in an extensive or a restricted area, serve a particular class of the public, establish an open or closed shop, or admit its workers to some sort of participation in administration and management, are administrative problems. These problems once settled and policies relating thereto determined by the administrative authority (which may overlap or even coincide with the management authority), managerial problems arise concerned with establishing an organization and procedure, and the conduct of such procedure, to carry out the administrative policies. This distinction between administration and management clearly in mind, it may be understood that administration is largely a process of forming judgments, may have serious social, political and other moral aspects, must be largely empirical, and can utilize in but a limited way principles and laws determined by the scientific method of investigation; whereas management on the other hand is concerned with the relations and reactions of particular forms of organization, routine, materials, equipment, and physical and psychical conditions, may proceed upon principles determined by the scientific method of investigation, and is more or less mechanistic in its nature. It may be understood also how, through absence of a clear comprehension of the difference between administration and management, and through a failure to distinguish between the nature and technical efficiency of scientific management *per se* and the administrative problems (social, political and otherwise moral) arising from its use, confusion and controversy have appeared in the public's attempt to appraise scientific management.

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[1] An article prepared for the forthcoming new edition of the *Encyclopedia Americana*, and printed here by permission of the *Encyclopedia Americana*.

[2] Managing Director, Taylor Society, New York.

Early History: The System

In 1878 Frederick Winslow Taylor (1856-1915) entered the employ of the Midvale Steel Company as a laborer who had served his apprenticeship as pattern-maker and machinist. He became successively time clerk, lathe gang boss, assistant foreman, master mechanic of repairs and maintenance, chief draftsman, and in 1884, at the age of 28, chief engineer. From the beginning of this period he was in continual struggle with the workmen to increase output, which he knew from his experience as a workman was extremely low. There developed the anomalous situation, not infrequent in industry of that day, of agreeable personal relations between foreman and individual workmen accompanied by a bitter struggle concerning output between foreman and the workers as a group. Taylor, as foreman, attempted to apply the then customary foremen's method of suasion and force with the usual result of increasing the bitterness of the struggle. Concluding that he could master the situation only by knowing more than the most skilled workman about the technique of production in the shop, and about what a skilled workman should do, he applied his investigative and inventive mind (he came subsequently to hold over 100 patents) to the problem and began two lines of experiments which he pursued through many years with great thoroughness and at great expense. One related to the machine, the tool and the material (metal cutting), and the other to the workman's method of handling the machine, the tool and the material (time and motion study). The former line of experiments, continued later at the Bethlehem Steel Company, led to the discovery of high-speed steel and revolutionized the art of metal cutting (*Transactions American Society of Mechanical Engineers,* XXVIII: 1906); the latter line of experiments, greatly broadened, led to the development of a coördinated system of shop management and ultimately, as an interpretation of that system, to the formulation of the philosophy of management which came to be known as scientific management. The logical and approximately the chronological steps of the development of the system of management, essential to an understanding of the principles which came to be formulated, were: (1) Experiments leading to dependable knowledge of how long a particular machine operated, or a particular manual process performed, by a skilled workman would require to accomplish any specified result, with a given material, according to a specified most effective method of operation, and under specified working conditions. This knowledge, obtained principally by stop-watch studies of unit-time performances, permitted the setting of practicable standards per man-hour or machine-hour higher than the average of current performance; (2) The establishment of a routine of preparation and direction which would insure maintenance of the conditions under which the standards were set, which led to the working out of such mechanisms as routing, order of work, instruction cards, purchasing materials according to specifications, central stores and controlled conditioning and delivery of materials and tools; (3) The selection and assignment of personnel to machines or operations on the basis of skill and the further development of skill in workers, and (4) the establishment of specialized skilled supervision of workmen to insure maintenance of conditions and to provide instruction. These objects (3 and 4) were accomplished by functionalized foremanship, a gang boss having general supervision of the order of work in the shop, a speed boss supervising the setting up of the machine, and an inspector inspecting the product both at the beginning and at the completion of a job. (5) The constant and current checking of progress against standards by cost accounting, the data for which was derived from the operating papers; and (6) of far-reaching importance in its ultimate influence on the managerial attitude of mind, the substitution in place of the conventional "foremen's persuasion" in securing performance by workers, of voluntary application on the part of the latter through the incentive of a higher wage made possible by the increased productivity. During the years 1891-1900 these gradually developed devices became coördinated into a smoothly-working system, in which those supervisors whose duties required personal contact with workers remained in the shop, while those whose duties were in the nature of planning, preparation and control through "papers" were brought together in an office called the "planning room", adjoining the shop.

Later History: The Principles

The interpretation of this system of management in terms of principles of management seems to have been inspired by Taylor's contacts in the American Society of Mechanical Engineers, which he joined in 1886. In that year Henry R. Towne presented to the society the paper *The Engineer as an Economist* (*Transactions American Society of Mechanical En-*

gineers, VII: 425-32, 1886), significant because first directing attention to management as something other than the expression of executive ability, in the assertion that to insure good management there must be joined to executive ability "a practical knowledge of how to observe, record, analyze, and compare essential facts in relation to wages, supplies, expense accounts, and all else that enters into or effects the economy of production and the cost of the product." During the ten years following the presentation of that paper other papers, relating principally to a particular phase of the management problem—methods of wage payment, were presented and discussed in the society. Taylor's *A Piece Rate System* (*Transactions American Society of Mechanical Engineers,* XVI: 856-903, 1895) is the most notable among these in that he therein described the general system of management which he had developed, arguing that it embodied managerial principles which must be the basis of any sound system of wage payment involving premiums or other differential reward. The title and emphasis of this paper centered attention on his differential piece-rate and not, to his disappointment, on the management principles implied. Therefore in 1903 he again appeared before the society with the paper *Shop Management* (*Transactions American Society of Mechanical Engineers,* XXIV, 1337), in which he attempted to direct attention from his piece-rate system to what he called a philosophy of management. The body of this philosophy, as presented by him, was essentially the following principles: (1) The objective of good management is the combination of high wages and low unit costs; (2) This objective can be achieved only by the application of strictly scientific methods of research and experiment to the study of the detail problems of management, and (3) the establishment thereby of laws or principles which may be expressed in standards of procedure which give control of operation; (4) the scientific selection of workmen, materials and processes and the establishment of working conditions to meet the requirements of the standards; (5) the scientific training of the workmen to improve the application of their skill in accordance with the standards, and (6) the establishment of such intimate and friendly coöperation between management and workers as to insure a stability of the psychological environment of the shop which would make possible the application of all the principles above enumerated and the utilization of the mechanisms necessary to give them effect.

Recent History: Since the Eastern Rate Case

Again Taylor's audience in the American Society of Mechanical Engineers failed to appreciate the significance of his contribution. Interest of the members of that society and of the public in general was attracted, not by these serious, scientific papers and discussions, but by sensational testimony concerning the results of scientific management in the shops in which it had been developed, given at a hearing before the Interstate Commerce Commission in 1911, involving consideration of the efficiency of the railroads (*Interstate Commerce Commission Reports,* XX: 243), and at an investigation in the same year by a special committee of the House of Representatives appointed to investigate, on a petition of organized labor, the effects of Taylor methods at Watertown Arsenal. It was at these hearings and in the title of a book which Taylor published at this time (*Principles of Scientific Management,* 1911) that the term "scientific management" was first used. From that time on public interest in scientific management was intense and sustained, and discussion of it continuous and occasionally acrimonious, although not always discriminating. Interest and discussion was not confined to the United States, and foreign demand caused the translation of Taylor's papers into French, German, Italian, Japanese, Dutch, Russian and Lettish.

This sudden intensification of interest in scientific management may be accounted for by the fact that in 1911 the industrial community was prepared for such a body of logical and practical management principles manifested in a comprehensive system of management mechanisms. There had been for a decade a growing general interest in betterment of management. This general interest had yielded improved management devices such as cost accounting and "systems" of control through "forms" which made more precise but did not modify to any great extent existing practice. It had inspired an increasing volume of books and articles concerning special problems of management and descriptive of industrial organizations and procedures which represented the best in existing practice. It had led to books and articles of an exhortatory nature and of stimulating influence which gave a touch of idealism to the consideration of management problems (Harrington Emerson: *Efficiency as a Basis for Operation and Wages,* 1909; *Twelve Principles of Efficiency,* 1910). But it was not until the Eastern Rate Case of 1911 that interest became widespread and intense. The testimony concerning the accomplishments of scientific management in decreased unit cost and increased profits combined with higher wages appealed to the primary motive of industrial activity; the completeness and coherence of Taylor's system and of the principles which it expressed appealed to the intellect of the serious student of management problems; and the very term "scientific management" appealed to the imagination of everyone. The public mind and discussion at once seized upon the term and gave it a generalized application almost as broad as had been represented by the term "efficiency". For that reason students of management must exercise discrimination in distinguishing between the definite, historical meaning and the popular, generalized meaning of the term, and between real, partial and in some instances alleged cases of the application of the principles.

Results

The results of the development of scientific management in industrial plants have not been adequately summarized and presented. Management engineers have been conservative, as a matter of professional ethics, in disclosing results of work in the plants of their clients. Many investigations by others have been vitiated by one of two attending circumstances: either the investigator has been biased in a desire to find controversial evidence or by a preconceived philosophy of industrial relations; or he has failed to inform himself concerning the history and nature of scientific management, and has been led to investigate plants reputed to have, but really not having, scientific management. The most reliable and complete evidence of results is to be found in the records of the hearings before the Interstate Commerce Commission and of the special committee of the House of Representatives, referred to above, veritable mines of information, and the most satisfactory summaries in articles by C. Bertrand Thompson (*The Theory and Practice of Scientific Management,* ch. III) and Henry H. Farquhar (*Quarterly Journal of Economics,* XXXIII: 466), in Brandeis' *Scientific Management and Railroads* (1917), a published part of a brief submitted to the Interstate Commerce Commission, and in the reports of the Chief of Ordnance, U. S. A., 1911, 1912 and 1913. It is the concurring testimony of these several investigations that scientific management reduces unit costs and increases wages and profits, in many instances simultaneously with reductions in selling prices, and that industrial relations with the workers immediately concerned are improved.

Labor and Scientific Management

An almost incomprehensible phase of the history of the scientific management movement is the existence, side by side, of improved industrial relations in those plants in which scientific management has been developed and strong opposition on the part of the management of the American Federation of Labor. The opposition of the management of organized labor seems to have been inspired by fear of the impairment of a fundamental element of their strategy (that their organization must be increased in membership and held intact, for the accomplishment of their larger objectives) by one of the least important mechanisms of scientific management, the differential wage system. Inspired by this fear, and taking advantage of certain opinions held by workers (such as the opinion that increased output will cause unemployment) and certain infelicities of speech and illustration on the part of expounders of scientific management (such as the famous Schmidt case), and presenting statements concerning the actual operation of scientific management not based on critical investigation and not conforming to facts (that workmen are speeded up and worn out, that time-studies are secret, that rates are cut, etc.) the management of organized labor undertook a campaign of education of its membership which resulted in an almost solid opposition by the rank and file as well as the officers of organized labor to scientific management. In public discussion, to the opposition of organized labor was added the opposition of many social scientists who, without information derived from either experience or investigation, asserted that scientific management would make impossible the achievement of any ideal of industrial democracy. Throughout all this controversy the natural confusion of polemical discussion was worse confounded by absence of critical investigation of facts, inadequate information, and particularly by a failure to distinguish in the discussion of scientific management as a social problem, between management and administration. In this controversy the arguments against scientific management as a system of management technique were ineffective because not supported by the facts; on the other hand the arguments against scientific management with respect to its social implications were significant and of influence, but they were really arguments concerning administrative policy governing the use of management technique, and not more pertinent to scientific than to any other form of management. Superficial critics failed to perceive the point that the effective working of the scientific management mechanisms in particular depends so vitally upon sympathetic coöperation between planner, supervisor and operator, that anti-social administrative policy is inconsistent with its development and technical effectiveness.

Influence of the War

The status of scientific management has been profoundly influenced by the war. Three influences are noteworthy: (1) Although the prejudice of workers engendered by the sharp controversy preceding the war has not disappeared, open and active hostility of labor has been discontinued and apparently will not be resumed; (2) the demand for output during the war, supported by labor, compelled a wider extension of efficient production methods, in some instances of the methods of scientific management, not only in the United States but also in Europe, and both labor and management have learned by experience that scientific management technique is not inconsistent with wise, humane and coöperative administrative policies; (3) labor and management have observed that during and following the war managers of scientific management plants and scientific management engineers have been in the van of those inspiring and directing the establishment of the most humane and coöperative administrative policies, in accordance with the most farsighted principles of industrial relationship. War seems to have cleared away prejudice and misunderstanding and to have made possible an appreciation of the value of scientific management as an instrument for the increase of the productivity of human effort under wise administration.[1]

THE primary object of any industry is production—production of commodities or of services. In these commodities or services three groups in society have an economic interest. These three groups are the capitalist whose money is invested, the worker who supplies the labor, and the consumer who pays the price for the commodity or service. As viewed from the welfare of these three classes, which combined comprise all members of society, the fundamentals of the finances of production should be a fair return to the owners of the capital, a fair wage to the possessors of labor, and a fair price to the consumers of the commodity or service. These finances should be so organized that attainment of any two of these fundamentals or objects would automatically produce the third. That is, a fair interest or dividend and a fair wage should of themselves in combination result in a fair price; a fair interest or dividend and a fair price should of themselves in combination result in a fair wage; and a fair price and a fair wage should of themselves in combination result in a fair return to capital in interest or dividends.

If this is true then it is equally a fact that the prime essential of the finances of any corporation engaged in production is to show the actual true capital investment of money and services. If the finances do not show this—if the true capital investment is arbitrarily increased by paper capitalization and hidden or concealed by corporate organization and similar methods—then it is impossible to ascertain what is a fair return to any single one of the three elements to successful production. If, for example, only one million dollars of money and services are invested in a corporation, with its finances showing a capitalization of, say, ten million dollars, and an endeavor is made to pay a return on the ten million, there cannot possibly be a fair return on capital, a fair wage, and a fair price—every one of the three is most likely to be unfair. So at the very outset it is impossible, for any industry so capitalized to supply the essential elements of fairness to the three classes interested in its production.[2] (Frank Julian Warne in THE ANNALS, No. 174, p. 271)

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[1] A concluding bibliographical paragraph is omitted.

[2] The writer is familiar with the stock phrases that endeavor to justify over-capitalization, but all such arguments stress profits to the individual and not service to society.

POSITIVE CONTRIBUTIONS OF SCIENTIFIC MANAGEMENT[1]

THE ELIMINATION OF SOME LOSSES CHARACTERISTIC OF PRESENT-DAY MANUFACTURE

By Henry H. Farquhar[2]

SUMMARY

I. Introduction, 15.—II. Mechanical or Personal Aspects, 17.—A. Increased Production, 17.—B. Decreased Cost, 17.—The Use of Equipment, 18.—The Use of Labor, 19.—Material Control, 19.—Routing, 20.—The Regularizing of Production, 20.—C. Improvement in or Maintenance of Quality, 21.—D. Speedy Production and Accurate Delivery, 21.—E. The Power and Stimulus of Knowledge, 22.—III. The Human Factor, 22.—A. Industrial Peace, 23.—B. High Wages, 24.—C. Proper Working Hours, 24.—D. Conditions of Work as Related to the Health and Well-being of the Worker, 25.—E. Selection, Fitting and Training, 26.—F. Free Scope for Individual Initiative and Opportunity for Advancement, 26.—G. Reduction of Labor Turnover, 27.—H. A Spirit of Coöperation and Confidence, and a Feeling of Security, 28.

I. INTRODUCTION

TODAY, when present and impending conditions are trying men's souls and forcing a weighing in the balance of their past achievements in so many directions, it seems appropriate and important to make at least a partial appraisement of the contributions of scientific management to the field of industrial problems. It may be well, however, at the start to look back briefly over the successive stages of its development in order to arrive more fairly at a true estimate of its present value, and to enable a correct forecast of its potential worth as a means for the adjustment of present and future social and economic problems.

As long as the early discussions and the evolution of the science were confined within the bounds of the American Society of Mechanical Engineers, the public knew little of what was taking place. This was as it should have been, for the early papers[3] which stimulated discussion and really crystallized and forced the concrete statement of principles and methods, later served as the substantiation of the most potent claim of scientific managers—namely that scientific management is not a *theory* evolved on paper by a more or less practical dreamer, but is the result, tho as yet imperfectly expressed, of carefully worked out solutions evolved by far-sighted and eminently practical managers and engineers to meet everyday problems. Such theory as has been developed was preceded long years by sound practice.

With the Eastern Rate Case hearings in 1911, however, came the second stage, the public awakening; and immediately succeeding it came a flood of popular articles, extravagant claims, and vehement denials. There was a mad scramble on the part of various owners of industries (possessing a lamentable lack of understanding as to what this new movement really was) to secure this "panacea," and of course an equally eager readiness on the part of incompetent and frequently unscrupulous charlatans to supply the demand. It is safe to say that had not such abundant evidence of the real value of the fundamental *principles,* properly applied, been available during this period, the inevitable reaction would have been much more severe and of much longer duration. The fact that it was not is only another tribute to the (possibly unconscious) farsightedness of the real leaders in the movement.

For there is no question that the reaction is largely past and that we are now in the third stage. This does not mean, however, that there is not still a tremendous amount of misunderstanding as to the real significance of the movement, or even a considerable amount of active opposition. The third stage is again clearly reflected in the literature on the subject. The popular matter has dropped out pretty completely and has been replaced by an already large and constantly growing number of articles dealing, on the one hand with concrete illustrations and explanations of the actual workings of the system or of parts of it, and on the other hand with frequently altogether healthy and well-intentioned, tho unfortunately not always well-informed, attempts to appraise its true economic significance. The active and open opponents, failing to find proof of the fulfillment of their dire prophecies as to the ill effects on the workman and the heartlessness of it all, have largely been driven to a less outspoken if more insidious activity, unwittingly furnishing tremendous arguments for the extension of what they sought to kill through measures forced on misinformed legislators in a vain attempt to stop the inevitable.[1] And incidentally, those of the Taylor persuasion—upon witnessing the constant putting forth, by those either ignorant of or actually opposed to the Taylor System as such, of "new" and brilliant ideas in management, incorporated long since in the practices of that group—may be pardoned for an unseemly chuckle up their sleeves at the rapid and irresistible spread of the principles and methods for which they have long stood. Not only in current trade journals laying no claim to being scientific management disciples, but also in the practices of many managers, some of whom at least lay claim to being exactly the reverse, is this tendency most noticeable. Only upon coming in more or less close contact with numerous plants is that fact brought home so forcibly.

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[1] Reprinted by permission, from *The Quarterly Journal of Economics*, XXXIII: 466-503. May 1919.

[2] Management Engineer, Belmont, Mass. Member Taylor Society.

[3] Towne, "The Engineer as Economist," Trans. A. S. M. E., vol. vii, p. 425; Towne, "Gain Sharing," ibid., vol. x, p. 600; Halsey, "A Premium Plan of Paying for Labor," ibid., vol. xii, p. 755; Rowan, "A Premium System, Applied to English Workshops," Proc. Inst. of Mech. Eng., March 20, 1903, p. 203; Taylor, "A Piece Rate System," Trans. A. S. M. E., vol. xvi, p. 856; Gantt, "Bonus System for Rewarding Labor," ibid., vol. xxiii, p. 341; Taylor, "Shop Management," ibid., vol. xxiv, p. 1337. Gantt, "Graphical Daily Balance in Manufacture," ibid., p. 1322; Barth, "Slide Rules as Part of the Taylor System," Trans. A. S. M. E., vol. xxv, p: 49; Dodge, "A History of the Introduction of a System of Shop Management," ibid., vol. xxvii, p. 720.

We may say, therefore, that the sensational and propagandist period is past, that the foisting of half-baked "efficiency" schemes on an unsuspecting and overeager public is rapidly passing (altho there are still, unfortunately, too many managers who give less attention to the selection of an industrial adviser than they give to the purchase of a new machine), and that the skeptical stage—the "my business is different" attitude—is gradually passing with the constant addition of new lines of industry to the list of scientifically managed plants,[2] and that we are now in a period of healthy growth accompanied by a much more sympathetic and truer understanding of the fundamental nature of the principles and problems involved. "Scientific management" has comfortably taken its place among the things which are here to stay.

It is perhaps a little early to attempt to judge of many of the economic problems raised by scientific management—the smoke of battle is yet a little too pungent, and we are not yet sufficiently removed from its beginning to enable us to get a true perspective of the movement as a whole. Whereas in the past, however, it has been necessary to speculate as to its *probable* effects on this or that phase of the problems presented, and even tho we may still justifiably concern ourselves in this manner with the numerous as yet unsolved questions, we can now, nevertheless, get a much clearer perspective than has been possible heretofore and perhaps more profitably focus our attention on the *positive* aspects and accomplishments in certain directions, realizing that it is no longer theory but facts with which we are dealing. If the writer succeed in crystallizing a few of the accounts on the debit side of our balance sheet by bringing together some of the concrete economic losses already eliminated or alleviated by scientific management, it may perhaps make easier our minds as to the state of the science as a whole.

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[1] I refer to the anti-stop watch and premium-payment riders to the Army Appropriation Bills. Before the Committee on Military Affairs on January 4, 1917, Brig. Gen. William Crozier, Chief of Ordnance, in discussing the Taylor System at the Watertown Arsenal submitted testimony in substance as follows: Hearings before the Committee on Military Affairs, Army Appropriation bill, 1918, pp. 955-964; see also Congressional Record for February 1, 1917, pp. 2654-60:—

After the Taylor System had been in operation at the Arsenal a year or more a comparison of identical jobs showed that the men on the average did 2.7 times as much work after its development as they did before. In the machine shop where most of these jobs were done, the average increase in output was 2.2. (See decrease for this department upon abolition of premium payment, below). The work was more carefully done, of a higher quality. There had been to date of testimony, January 4, 1917, some seven years after the system was inaugurated, no single instance in which a man had complained of overwork. The spirit and contentment of the men had never been so good as they were during the several years in which the system was in operation. For a number of years the average earning of premiums of the workmen, above the regular day wage which in itself was equal to that of other plants in the vicinity, was about 27 per cent of their pay.

By congressional action the use of the stop watch and the payment of premiums were abolished. A comparison of identical jobs done in many cases by the same workman both before and after this proviso went into effect shows in the worst case, that of a job done by the same man, that he took 4.2 times as long to do the work after premium payment was abolished; in other cases the ratios were 3.6, 3.0, 2.9, etc., with average ratio as follows:

Machine shop, 2.2 times as long when not on premium.
Foundry, 1.6 times as long when not on premium.
Smith shop, 2.1 times as long when not on premium.
Yard gang, 1.8 times as long when not on premium.

The atmosphere of industry and application which was previously so noticeable changed materially, there was much more loafing and the men had no desire to exert themselves after premium payment was abolished. The earnings of the men of course dropped back to regular day rate, and the cost of manufacture was considerably increased.

[2] Cf. C. B. Thompson, "Scientific Management in Practice," Quarterly Journal of Economics, February, 1915, p. 262, in which eighty-three different industries are listed since which time there has been a noticeable increase in the number.

In considering the effects of scientific management from the standpoint of its positive contributions to industry we may take up first the mechanical phase—the more purely impersonal aspects—divorced so far as possible from considerations of its direct effect on the individual, leaving the human factor as the last and most important topic. The two are to a certain extent interactive, yet sufficiently distinct to warrant separate treatment.

II. THE MECHANICAL OR IMPERSONAL ASPECTS

A. INCREASED PRODUCTION

Turning first then to the effects of scientific management on industry as such, as exemplified by those establishments directly affected by it, by far the most striking single fact is the *increase in production* it has effected with the same equipment and personnel. This has occurred in many cases to such an extent as to be almost unbelievable. Ten, twenty, thirty per cent increases are the rule, and an output twice or even three times as great as had formerly been secured is not uncommon. And these results have not been uniformly secured, as might be supposed, from plants that were near the lower level of efficiency before the development of the system was started. On the contrary, in many cases the standard of production was comparatively high, and I know of one case where the production was increased over 60 per cent in a plant which from every standpoint was previously generally considered to be absolutely the most efficient of its kind in the country. The desire for increased production is often, indeed, one of the minor causes for the management's determination to have scientific management—too often the output is greater than ever before and yet the firm through other causes is losing money, or conditions are unsatisfactory in other respects.[1] But in just that same plant when scientific management *is* developed, the output is almost sure to increase—incidentally as it were.

Increase in production has been the cry of economists for centuries, and for centuries they have had their cry answered—at least partially. For it is the exception where, take any industry you will, with the *constant substitution of new and improved labor saving machinery and equipment* the output has not been very largely increased over what it formerly was. Our industrial highway is strewn with the corpses of those individuals who would not or could not keep abreast of these improvements.

Such increases, however, altho they may enable the individual to survive, may not and often do not wholly satisfy economic demands. They are brought about by the *substitution* of new machines for those already in use, oftentimes long before the latter have earned their keep. I heard of a case where recently in one department, new machines costing thousands of dollars and having been in use less than one year, were scrapped to make way for new and supposedly superior machines.

The increase in production brought about through scientific management, however, is of a fundamentally different nature. True, the scientific manager does not tolerate obviously antiquated machinery, but he does not tolerate inefficient machinery of any kind, and it is just here that his real economic contribution comes in. With him it is not a case primarily of increase in production through new machines; it is first and foremost a case of increase through *getting the most out of existing equipment* and personnel. Only after present means are brought to their highest productiveness may the question as to whether new equipment is justifiable be satisfactorily determined. With the present mania for new equipment, we may well inquire whether, in very many cases, these changes do not impose an added rather than a lessened burden on the consumer. If a proper charge for such rapid obsolescence as well as a regular charge for depreciation were figured into the expected cost resulting from the contemplated "improvement," and particularly if this expected cost were compared not with present costs with existing equipment, but with what those costs *should be*, it is safe to say that many new machines would go unbought, that many firms would avoid bankruptcy, and that the owners as well as the buying public would profit thereby. It is just here that the line between the two kinds of increases may be sharply drawn, which brings us to the consideration of the financial aspect of the question.

B. DECREASED COST

For all practical purposes the consumptive capacity of mankind as a whole may be considered to be unlimited. Yet not infrequently there has occurred a state of so-called "overproduction" in one or more widely consumed lines of commodities. This apparently anomalous state of affairs will be found, upon analysis, to be due not to overproduction as such—not to a simple cessation of demand because of satiated desire—but to a conviction on the part of the consuming public, that *at that price* under existing conditions the commodity in question no longer yields the demanded return for money invested in it. What was formerly exchanged for this commodity now goes elsewhere where the equivalency is considered to be more attractive. Lower your price on this one commodity, however, and see what happens:—the balance of equivalency just established is again disturbed, the commodity now immediately represents a relative increase in return, those articles which before replaced it are now themselves replaced by it, and we get back at least to the original state of demand with possibly an added demand. Continue to lower the price, and this commodity will continue to edge its way into favor, constantly disturbing the balance and in constantly widening circles continuing to replace other articles which we deem, in comparison, as of lesser utility.

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[1] Witness a recent demand on the part of workmen in one large shop for the initiation of time study as a means of more accurate rate-setting.

It would then seem clear that a simple increase in production without at the same time a decrease in unit cost (and therefore, in the long run, in selling price) cannot of itself in the great majority of cases be considered an economic gain [1] and may at times lead to a direct economic loss—overproduction. Furthermore, a simple increase in production with an accompanying decrease in a cost which, due to inefficiency in management, was hitherto higher than it should reasonably have been as judged by modern standards, may not and usually does not wholly satisfy economic demands. It is only erasing the negative and getting back to par, as it were, but failing to add a plus.

Where the increase in production and the decrease in already satisfactory cost go hand in hand, however, our gain is direct and indisputable.

It was for this reason that the distinction above was drawn, and it is on this ground that scientific management may lay just claim to a more favorable economic judgment than the prevalent increase in production brought about through new equipment which may not be economically justifiable. With its insistence on present efficiency before new equipment is permitted, which with its accurate cost system furnishes a basis for determining the effectiveness of contemplated substitutions, scientific management has a very much firmer foundation upon which to rest its claim. It of course has also the absolute reduction in cost in addition.

Of the various *means* by which scientific management increases production and decreases cost, some—such as the selection, fitting and training of the workers, the reducing of labor turnover, absences, lates, etc., the determining and securing of a proper day's work and the paying of a correspondingly increased wage—are distinct economic gains in themselves. These will be discussed under the human factors. Others, however, must be considered simply as the elements which go to form the most outstanding contribution of scientific management under this head—decreased cost—and as such several merit discussion here.

1. *The Use of Equipment.* Closely connected with the question of new equipment referred to above, is that of the full utilization of that now on hand, using the term in its widest sense to include all facilities of production.

A certain amount of idleness of equipment is of course unavoidable. That it should be even one-half of what it unquestionably is, however, is a striking commentary on the lack of foresightedness of many managements. The encouraging feature about it, however, is that a large proportion of idleness can be prevented and that a few progressive managers are informing themselves and taking effective steps to remedy the evil. Less encouraging is the fact that the extent and seriousness of the losses through idle equipment are seldom appreciated by the manager until it is brought forcibly, even violently, to his attention through cold figures. In comparatively few plants is a record of machine time regularly and systematically kept, and in still fewer instances is the effort made to determine in each case the exact cause of idleness upon which to base intelligent remedies. If, as advocated by Mr. Gantt,[2] each manager could be shown that during the last two months a certain group of machines was idle say 40 per cent of the time, and that this idleness was distributed as follows:

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[1] I am not considering those rare instances where an increase in production with decreased cost may be an economic *loss* (in the case of whiskey, e. g.), nor where an increase in production even at a decided increase in cost may be a distinct economic *gain* (in the case of food shortage, e. g.). Such cases are altogether exceptional and have no practical bearing on the present discussion.

[2] H. L. Gantt, "Productive Capacity as a Measure of Value of an Industrial Property," Trans. A. S. M. E., 1916.

Total Idleness		40 %
Unavoidable breakdowns		3 %
Avoidable breakdowns		12
Lack of work at machines		15
Lack of orders for product	0	
Lack of materials	4	
Unbalanced equipment	6	
Poor planning	5	
Lack of help		10

and if in addition the money loss from each cause could be shown, measures to reduce the idleness would follow almost as a matter of course. Nothing is more common than an abundance of room in what was previously a very much crowded and overburdened department after steps have been taken to balance, rearrange, standardize and maintain equipment, and it is not unusual to hear of a whole contemplated addition to a plant being found entirely unnecessary and consequently abandoned upon the presentation of such statistics as those cited above—a direct saving of usually thousands of dollars, to say nothing of the avoidance of actual loss (through decreased production or increased costs) which many times occurs with an enlargement of plant.

Just why such conditions exist it is hard to say. Attention to such matters should be one of the main duties of the manager. And with a table such as the above, he would soon make them his principal duty. Yet, even under present conditions, it seems so much easier to order new equipment, blame the seller for such slow deliveries that our production is held up, and overlook the fact that by the aid of such facts the way out lies right under our noses. The answer probably lies somewhere between our natural aversion to real thought and planning, and the fact that the prevalent forms of organization keep the manager so hemmed around with ordinary routine that he is left no time in which to conceive and execute manifest reforms. The exception principle in management emphasized by Mr. Taylor, merits a much wider application on the part of most of our executives.

2. *The Use of Labor.* Unlike an idle machine, there is of course no such thing as an absolutely idle man permitted in any plant, yet a man who, before thoro time study and planning might be considered to be extremely busy—as indeed he might be, tho perhaps inefficiently so—in the light of highly systematized working conditions would be thought of as having been previously very ineffectually employed. The term "idle" is becoming a relative one. In general, except as the human element, to be discussed, enters here, the same conditions as pointed out for idle equipment are applicable in this case, and for the present the two may be considered as of like nature and effect. Taken together they constitute the most tangible field for reducing costs.

3. *Material Control.* The stores system in a scientifically managed plant is typical of the minute control designed to be exercised over all departments of the work. It is designed to cover the four factors covering the efficiency of material use: Quality, Quantity, Time, and Cost, and great care is taken to maintain the proper balance between these four interdependent variables so that their resultant effect will be the best for any given case, all things considered.

It is not the purpose of this general review to go into a description of either the methods or the exact results of the various means by which modern management's economic contributions are made. To do so, even for the present topic, would require volumes. Only the broader features can be briefly touched upon. In general it may be said that the principal losses in the materials field occur on the one hand through oversupply, and on the other through undersupply; and curious as it may seem, losses from both sources occur most often in the same plant.

It is the exception where the cost of installation of the stores system does not pay for itself by immediate savings effected, and in many cases these savings arise largely through the elimination of surplus stock and useless varieties, and through effecting a more rapid turnover. In fact, reports as to the amounts of junk disposed of in various plants upon the development of the stores system would be almost unbelievable to one who has not had first hand contact with this work, were it not for the records supporting the statements. Tons and tons of supplies—ordered by the foreman for the expected rush which did not materialize, parts lost or rejected in process, duplicate orders uncaught, "rainy day" and spoiled parts cached by the workman, wrong material delivered and not sent back, parts for discontinued products, and fantastic variations from standard—all accumulate in the storerooms or at various odd places (including valuable working space) throughout the plant, until a detailed study of production requirements leads to a wholesale housecleaning. Immediately and almost invariably, the inventory of stores which it is necessary to keep on hand is decreased, releasing idle capital. This capital invested in turn becomes more productive through more rapid use.

The experience of the Watertown Arsenal where, upon the development of the system, the savings in one year resulting from the use of *surplus* stock amounted to $122,789.61 is typical of many, many plants in this respect. Similar instances could be multiplied almost indefinitely.

Looking behind such conditions we readily see not only the general disorganization and lack of knowledge thus typified, but also the large amount of capital tied up, the inevitable depreciation and deterioration of stock, and the general interference with the flow of work in productive processing. Add to this the elimination of the generally rapidly disappearing annual or semiannual shutdown for inventory taking, and the sources of the large savings become apparent.

Similarly, lack of the proper material at the right time is frequently the cause of expensive delays, postponed delivery dates and even loss of trade. Here again a certain amount of lost motion is unavoidable; but that four-fifths of the current inconveniences and losses experienced in material handling can be eliminated by detailed knowledge and proper planning is proved by those scientifically managed plants which have systematically attacked and regulated stores problems.

4. *Routing.* The decreasing of costs through the full utilization of equipment, of men, and of materials has been discussed. Another of the means by which this reduction is secured is the broader use and correlation of the business as a whole, including both the physical layout and the administrative control of the various component parts of the business.

Just what is meant by this topic, as well as its significance, may be illustrated by an example. In modern or scientific management a factory is looked upon from the strictly production standpoint as comparable to an automatic machine. Just why this conception is necessary may be seen from considering a compound full automatic consisting of five successive components, A, B, C, D, and E. As a piece is completed in any one of these parts, it is automatically swung around to be further processed in the next, and obviously that next must be free of its previous piece and ready to receive the new. Properly to set up such a machine of course requires detailed knowledge of and strictest attention to the time element for each head.

Now, a great many plants are being run today without an appreciation of the fact that the various departments of the plant as a whole are exactly analogous to the various parts of the automatic machine. The result is very much like the result would be if the automatic were set up either by one man who lacked or disregarded knowledge of all parts except that he was working on at the time, or by two men working independently without the knowledge of what the other had done, was doing or expected to do. In the case of the machine its various parts simply must be correlated and brought into proper synchronism by one man or by concerted action if by more than one; the same thing is less obvious but equally true in the case of the interdependent departments of the manufacturing plant if equally satisfactory results are to be expected. The "set up" and regulation of the various departments of most factories is an exceedingly complex and technical undertaking commonly defined by the term "routing," and not for a moment can any one foreman be allowed to run his department as he sees fit regardless of its relation to other departments and to the business as a whole. Hence the insistence in scientific management on a somewhat elaborate Planning Department, or at least on a central control of all activities which in any way have an interacting effect, and conscious and constant effort is put forth to secure this central control. As perhaps the finest example of the practical application of what has here been incompletely described, reference is made to the work of G. D. Babcock in the plant of the H. H. Franklin Manufacturing Company.[1] Suffice it here to emphasize the point that such control is the cardinal aim of every scientific manager, more or less perfectly realized in the best shops and secured through the systematic collection of all relevant information and through the practical application of this knowledge through measures collectively known technically as "control." This control is established through the proper use of such measures as standardization, time study, logical layout, careful routing of work and first-piece inspection, mnemonic symbols, the Order of Work and the Bulletin Board or its equivalent—all mechanisms which, in one form or another, have become integral parts of modern management.

5. *The Regularizing of Production.* Perhaps nowhere better than in the elimination of seasonal production and its attendant evils is the fact illustrated that what is of permanent benefit to the management

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[1] Babcock, G. D., The Taylor System in Franklin Management.

also benefits the workmen, and *vice versa*. It would in fact in this case be difficult to say to whom the larger benefit accrues—to capital and the consumer through full and continuous use of a minimum of plant, equipment and personnel, or to the body of employees through fulltime employment and regular wages. Operation under conditions of seasonal fluctuations is a direct economic waste to the community, and that in very many cases it is not an unpreventable waste has been amply proved by those industries which have attacked and eliminated the evil. It would of course be folly in this case as in so many others to claim any monopoly of effort along this line for scientific management plants—the case simply illustrates what may be accomplished along so many lines by what scientific management does make it a *definite policy* to do: a policy of conscious and continuous *taking thought* of the numerous economic and social factors which make for permanent success.

C. IMPROVEMENT IN OR MAINTENANCE OF QUALITY

Next to increased output and decreased cost, the question of quality of output deserves attention, for obviously, while in cases improvement in quality may be justified even with decreased production and increased costs, the reverse would infrequently be the case.

That the increases in production under scientific management have not been secured at the expense of quality would seem proved, if proof were needed, by the permanence both of those increases and of the firms which have secured them, and will be questioned by no one acquainted with the facts. As a minimum, the maintenance, at least of the engineer's "good-enough-is-best" quality, must be the first concern of those who expect fully and permanently to benefit by modern methods of management. It has remained largely for the time study man and the instructor, supported by proper quality bonus and thorough inspection, however, to prove that as between speed and quality there is not only no intrinsic irreconcilability, but indeed that with intelligent handling an improvement in quality usually accompanies increase in speed. Just why this is so may be left largely to the psychologist—we are here dealing simply with the abundantly proved fact.

D. SPEEDY PRODUCTION AND ACCURATE DELIVERY

It must never be forgotten that any industry, to remain in operation, must produce a profit. When it ceases to do so it loses the support of the investor and must perish. As a corollary to this it must be borne in mind that investments in plant, in materials, and in labor become bills receivable only when the finished product is shipped from the factory door. This shipment date then becomes one of the vital points of contact between seller and buyer—the earliest point ordinarily at which *expense* becomes convertible into *profit*.

The quoting of a minimum time necessary for delivery after the receipt of the order and the strict adherence to the specified delivery date are two commonly unappreciated factors in business success. From the buyer's standpoint they are outranked in importance only by quality, and oftentimes not even by that quite frequently intangible and relative characteristic. As between two reputable firms whose selling prices are not at too wide variance, the duration and definiteness of the time for delivery become governing considerations, and not infrequently indeed delivery outweights both quality and price. The firm which, on a basis of knowledge and through the systematic measures of control discussed above, can accurately predict and rigidly maintain delivery dates is not only in an enviable position from the buyer's standpoint but may claim a distinct contribution to itself, to the buying public, and to the community at large.

For every cessation of processing operations for lack of material, every delay due to machine breakdowns, every loss of production due to discontented or absent workmen—every interference with high production from whatever cause in our factory—is an economic loss; every failure to meet scheduled and attainable delivery dates (regardless of whether thereby the purchaser's schedule is also upset for in any event *our* turnover is less rapid than it should be and our costs must be higher than they should be)—every performance below a standard which, as gauged by current and freely available modern practice, may be reasonably expected and justifiably demanded, is an economic loss which must ultimately be paid for by the consumer.

The quickening of production and the consequent increase in rapidity of turnover, the informed and detailed control of work in process, and, resulting from these, the quoting of a quick and dependable delivery date—these factors characteristic of properly managed plants together constitute a decided antidote to the tendency for ever increasing costs of living.

E. THE POWER AND STIMULUS OF KNOWLEDGE

As a final consideration under the industrial or non-human aspects of the discussion must be mentioned, partially by way of summary, the numerous factors which considered as a whole form the possibly less tangible but nevertheless eminently comforting features of operation under scientific management. I refer to the confidence, the sense of security, the power and stimulus, the aplomb which spring from the knowledge that we have *real control* of our business through the ordered regulation of its activities according to adequate knowledge and best practice—one of those by-products of Scientific Management which are often of such transcendent importance.

There is something immensely stimulating about it all, something akin to the inspiration and confidence we feel when in the presence of a man who is a master of his subject and whose opinions and actions we know are based on thoro knowledge and thoro understanding. Who has not experienced the enthusiasm which comes with the final solution of an intricate problem; who has not experienced the stimulus of directing interdependent forces in perfect confidence toward a solution which, be what it may, we know must be the proper one because arrived at through absolute adherence to natural law. In the one case it is the enthusiasm of the chemist when he knows he has ferreted out a new element; in the other it is the confidence and the power of the master at his work.

This enthusiasm, this stimulus is nowhere more infectious than in industry. Striking proof of this is afforded by the avidity with which the "efficiency" gospel has been bandied back and forth between adherents and opponents during the eight or nine years it has been public property, and by the readiness with which very many of the largest and most progressive firms in the country have accepted and successfully applied the principles of modern management. It is fortunate that this is so, for in the search for and utilization of better methods wherever found lies the hope of American industry. The metal working industry generally has been tremendously spurred forward not only by the development of high speed steel, but also by the example of those plants which have not been content with being forced to adopt this means of increased production but which have voluntarily followed this measure up with others of far-reaching importance, and who have thereby postponed in their cases the time of diminishing returns. Tho lacking the same stimulus, there are increasing signs that the textile and other industries are shortly due for a less revolutionary yet none the less peremptory awakening. They also must catch up with the, as yet, comparatively few examples of advanced management among them.

The fear of the power of knowledge even more than that of the power of capital may well cause competitors to demand forthwith a balance sheet of knowledge. Tho capital is needed to put knowledge to work and to keep it there, capital without knowledge is likely quickly to disappear in competition with those who possess both. Knowledge without capital is a stronger asset than is capital without knowledge, for knowledge may be capitalized while capital cannot be educated. We may well pause to consider our probable future status when our competitor and not ourselves is one who knows how long work should take; who knows the capacity of each machine, of each department, and of his plant as a whole, and who takes measures to see that these various factors are properly balanced; who has worked out, standardized and reduced to permanent form the best methods of performing work; who really knows costs (as far as from their very nature they may be known) and knows at how low a figure he can sell in dull times and still make a profit or secure more work to keep his organization and plant intact even at no profit, and who knows when he does quote a specified selling price whether he is losing money on the sale or not. We may well consider our relative positions when he is the one who knows that there is no inherent inconsistency between wages plus and cost minus, because he knows, appreciates and acts on the fact that "maximum prosperity for the employer, coupled with maximum prosperity for the employee ought to be two leading objects of management." Such a competitor, we know, really *controls* his business and has a check on its efficiency—we are but alchemists, he is the chemist of industry.

III. THE HUMAN FACTOR

Just as increased production may be frowned upon if unaccompanied by decreased cost of the product and either of these may be censured if, thereby, quality is allowed to suffer, so none of these accomplishments can be recommended or tolerated if at the same time labor—the human element—be not kept in satisfactory adjustment and correspondingly benefited.

Important tho it be for the country at large that we have high production and low costs, that we establish a strong industrial basis, it is of greater importance that while we are making *things* we do not forget that our first and infinitely more important duty is the making of *men*—of good citizens.

Scientific management has from the first been a storm center around which questions of labor have raged. Because of its effects in so many particulars on human relations it must continue to be so.

Time and space might profitably be given to showing how, in the evolution of scientific management, more and more emphasis has been placed on the necessity of maintaining just human relations and of promoting the best interests of all concerned; how the very structure of the mechanism itself is designed to safeguard, to increase and to satisfy those interests; how its very nature is such that, so far from militating against those interests, it is vitally dependent for its very continuance on a proper maintenance of them. Certainly such considerations must prove of vital interest and concern to anyone who deplores and looks beyond the present troubled days. Profitable and interesting as such a story might be, however, I believe it to be still more profitable and pertinent to summarize, even somewhat categorically, some of the specific accomplishments known personally or through reliable authority which show in concrete cases the embodiment in actual practice of the theory and principles of scientific management. A theory may be ever so beautiful in the abstract; to judge of its soundness we must examine its results in practice.

Before turning to the discussion of concrete cases, it should be remembered that in considering the relations between industry as such and the individual, one is dealing with questions of tremendous significance and complexity. Many of the unsatisfactory conditions under which we work today are heritages of an age long past, just as many of the more satisfactory conditions today are in turn the successors to those once less satisfactory. The massing of workers, the economic dependence of the employee on the employer, the specialization of processes and the minute subdivision of labor, the aggregation and power of capital—the problems and ills of the individual arising through such factors have not, as is sometimes intimated, been brought on *by* scientific management; they are inherited problems and abuses with which, in common with other agencies, scientific management must deal. There is and can be no panacea for industrial ills—industry is not such a static thing as to make possible any such consummation. No movement can be justly judged from this standpoint—it must be judged according to the vigor and success with which it attacks and solves or ameliorates such unsatisfactory conditions as it may encounter under given circumstances. In the case of scientific management then, our inquiry must be, not whether it has completely solved partially unsolvable problems, but whether it is entitled as its exponents claim to be ranked as a movement which, as a cardinal principle makes a vigorous attack upon these problems a definite part of its policy, and which is in fact, perhaps more than any other one agency contributing in a substantial degree to their satisfactory adjustment. It is from this standpoint that the following discussion is offered.

A. INDUSTRIAL PEACE

It would be impossible to say to what one feature the freedom from "labor trouble" characteristic of plants operating under scientific management has been most due. Certainly no one feature in itself has brought this about, and probably not any one feature has been most potent, for high wages is by no means everything for which the workman looks to the management. The absence of labor unrest is due undoubtedly to a combination of causes—to increased personal individual production and improvement in quality with the resulting personal satisfaction; to high wages unaccompanied by overexertion; to individual and impartial opportunity, assistance, recognition and reward; to an adequate machinery for the speedy adjustment of grievances; to conditions of work, of pay and of opportunity measurably better than the labor union in neighboring plants of the same type has been able to obtain and at the same time to absence of ultra "welfare work" and similar measures which smack too much of paternalism and which tend, the workers feel, unduly to lighten the weight of their pay envelope. It is due to a spirit of coöperation—the "mental revolution" which is such a vital part of scientific management—to fair dealing, to a proper work environment, to a spirit of democracy, and to a feeling on the part of the employee that his best interest is being and will be looked after. It is due in fact, to the various factors discussed above and yet to be discussed considered collectively—it is inclusive of them all.

Summarize the causes as we may, however, the fact remains that in scientifically managed plants there has been remarkable freedom from the turbulent and distressing manifestations of industrial maladjustment characteristic of the last four years. It would be too much to expect that they entirely escape the epidemic of industrial unrest, but it is extremely significant that so far as is known through broad inquiry, such disturbances as have occurred have been of an altogether minor character, quickly and satisfactorily adjusted.

This fact is of preëminent important at the present time. It is unqestionably *the greatest* contribution of scientific management—all the more so because secured, not as industrial "peace" was secured during the latter period of the war by governmental *suppression* of the disturbance of industrial conditions by either labor or capital, but by *coöperation,* justice, and fair dealing.

B. HIGH WAGES

It has sometimes been claimed that, in the cases of certain profit sharing and other measures, daily wages have been depressed below the market rate in the exact ratio in which profits were to be shared. Whether the claim is well founded does not concern us here. So far as the writer knows, this accusation has never been laid at the door of Scientific Management. That it is not likely with justice ever to be is due to the dependent relation between daily wages and output. Starting with a current base rate of pay and the normal amount and quality of work customarily delivered by the operatives for that pay, scientific management first takes measures by which that production or that quality, or both, may be increased. Having thus provided the possibility of higher and better production, it then offers, as a matter of justice as well as of necessity, a correspondingly increased incentive for its accomplishment, payable at once regardless of whether or not during any given period a profit is made on the business as a whole. Each is necessary to maintain the other, and the increased wage is solely dependent on and must follow immediately, not precede, increased output.

Increases in the earnings of operatives working under scientific management are too common and well known to need repetition here. Bonus percentages, above the prevailing market rate of wages, vary from 20 per cent to 40 per cent or higher depending on the character of work, and on the average are earned on from perhaps 70 per cent to 90 per cent of the jobs worked upon.[1]

That the more progressive managers are beginning to question the prevalent empirical bases of wage determination and to seek for a more satisfactory basis is evidenced by an attempt on the part of several of them to reduce to formulae the effects of various factors previously wholly neglected or only empirically estimated. Thus Babcock[2] takes into account the following factors:

1. Rate of production.
2. Cost of living.
3. Number of processes workman can do.
4. Years of connected service.
5. Fixed charges rate per hour which man has chance to modify.
6. Percentage of premium earned.
7. Late or absence record.
8. Spoiled work.
9. Percentage of time under task.
10. Coöperation and conduct.

Such an attempt shows careful consideration of one of the three most important things for which the workman looks to the management: wages, conditions, opportunity.

Since the present paper is designedly little more than a synopsis of conditions as they are, it would be inappropriate to prolong it into a discussion of the various interesting social and economic aspects of scientific management as related to the wage question as a whole. It must suffice here to emphasize the undoubted fact that scientific management is leading the way both in the actual payment of wages higher than the general market level and in attacking some of the deeper fundamental phases of the problem.

C. PROPER WORKING HOURS

Mr. Taylor was one of the first to recognize and to prove the fact that overlong working hours are not conducive to high output, and that in very many cases hours of work may be sharply decreased *up to a certain point* and output increased simultaneously,[3] this point having to be scientifically determined for each class of work. The policy of reducing excessive working hours offhand, and of continuing thereafter to reduce them to a point not inconsistent with maximum gross output, has been consistently followed by his associates,[4] and scientifically managed factories as a body today are operating under at least as short hours as any other group of plants, while excessive hours on the part of any of them are unknown.

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[1] For typical records see Hearings before Special Committee of the House to investigate the Taylor and other Systems of Shop Management, vol. iii, p. 1502; Congressional Record, February 1, 1917, pp. 2655-57; Thompson, S. E., "Development of Scientific Methods of Management," Trans. A. S. M. E., vol. xxxix, p. 123.

[2] Babcock, G. D., The Taylor System in Franklin Management.

[3] For instance, see account of his early work at the Symonds Rolling Machine Company, "Shop Management", paragraphs 195-210. The same thing has happened in numerous other cases.

[4] See Thompson, S. E., "Development of Scientific Methods of Management," Trans. A. S. M. E., vol. xxxix, p. 123.

When one stops to consider it, it does seem rather remarkable, not to say significant, that scientific management presents such a uniform history of simultaneous increase in output, increase in quality, increase in wages, decrease in working hours and decrease in costs in those plants where it has been developed. Such is its record, nevertheless, in dozens of applications. It has ceased to be a novelty and is now the expected thing.

D. CONDITIONS OF WORK AS RELATED TO THE HEALTH AND WELL-BEING OF THE WORKERS

Looked at from a perfectly cold-blooded standpoint the return on the investment in the upkeep of the efficiency of the human machine exceeds that on the investment in the upkeep of the mechanical product. A moment's reflection will show why this must be so, for under proper conditions the human mind and heart delivers a *plus* which the inanimate machine is incapable of. From the entirely personal, selfish financial aspect, then, there can be no question that the very best condition for the employee is the very best condition for the owner of the business. And by the word "best" is here meant what is really best for the workman in the long run: wages neither too low nor too high, hours neither too long nor too short, general treatment neither too degrading through neglect or abuse nor too emasculating through ingratiation or paternalism.

From the purely economic standpoint, furthermore, this condition is equally true. It is economically wrong to allow the human machine to work under unsocial conditions of long hours, low wages, poor working conditions, unfair competition and lack of free scope for the proper exercise of one's individual abilities, because under such unsocial conditions best results are not obtainable from human beings. A prematurely incapacitated workman, much more than an inefficiently employed one, is a direct financial loss to the industry and a direct economic loss to the community.

But it is particularly the social and ethical aspects of the question which I wish to emphasize. That the owners and managers of plants under scientific management recognize and capitalize that source of additional personal profit is true; that they consciously consider their economic obligations may or may not be true; but that they primarily and continuously have the best interests of their people at heart, not from any ulterior motives but because they are that sort of person, I believe can be doubted by no one who will take the trouble to visit them and their employees. They would otherwise never have achieved scientific management—for scientific management is distinctly a thing to be achieved; it cannot be purchased and it cannot be had or maintained without this attitude.

One would naturally expect, therefore, to find in such plants satisfactory conditions as regards accidents, health and sanitation, the speedy and impartial adjustment of grievances, and comfortable working conditions generally. The providing of such necessities follows almost as a matter of course. In addition are found also in varying degrees of completeness rest and recreation rooms, playgrounds, libraries, lunch rooms where necessary operated at cost, first aid hospitals, etc., on an unpretentious scale according to strict utility. Such measures, if initiated upon actual need and if properly regulated, are appreciated by the employees and express the good will of the firm toward them. Then, as a step further, there are the mutual benefit societies and insurance and retirement funds which were initiated by Mr. Taylor very early in his work and which are very characteristic of plants following his lead as well as of many others at the present time.

There is another phase of this question, however, which is of much greater importance than most of the measures enumerated in that it affects the workman during his entire working hours while he is at the machine and for his entire life as a productive member of society. While it is important to provide means for caring for him during temporary sickness or disability and after he has ceased to be productive, it is at least equally important that his period of usefulness be safeguarded and prolonged through attention to his daily work. This is accomplished through the determination of "the best day's work that a man could do, year in and year out and still thrive under." The object of time study is just this—the determination of a proper day's work which, through allowance for rest and necessary delays, the workman may do year in and year out and thrive under. The setting of a task either too high or too low is equally shortsighted, since the object for which the study is made is thereby defeated. As a vital part of the determination of such a task is the investigation of the tiring effect on a workman for each class of work, investigations commonly described today by the term "fatigue study."

It is significant that the first "fatigue study" ever conducted in a really thorough and scientific manner, so far as the writer's records show, was performed over thirty years ago by Mr. Taylor as a part of his determination of a proper day's work.[1] Indeed, so far ahead of the time was he that, except as embodied in the routine of current time study according to the methods he and his associates developed and insisted upon[2], these early researches seem until very recently to have been generally overlooked until the admirable work of the British Health of Munition Workers Committee served again to emphasize their importance.

And in closing the discussion of this topic, it may be stated that, in spite of the oft-expressed fears on the part of various estimable gentlemen that the so-called "speeding up" would result to the immediate or ultimate detriment of the worker, no authentic case of anything but beneficial results has been brought to light.

E. SELECTION, FITTING AND TRAINING

It would be difficult to overestimate the advantage both to the individual and to the nation of a condition where each person could be engaged, under conditions satisfactory to him, upon work for which he is naturally best fitted. The misfits in industry are the causes of a direct loss of thousands of dollars annually, and of a loss of initiative impossible to appraise and of far greater importance. In the first place it is an economic waste to hire a workman who is not fitted for the work in hand. This waste is not always avoidable or even to be avoided under all circumstances, however. In the second place, after a man is hired he must be quickly trained to his full productiveness or transferred without delay to work on which this will be possible. He must in the third place, both for his own sake and for that of the management, be taught to do several different operations if possible (see Babcock's formula, item 3, page 24 above), and finally in the fourth place he must be given an opportunity to measure up to his full abilities as he proves, by careful and impartial records, that he can assume increasing responsibilities. It is a direct loss to employ a man on work for which he is not fitted, or to fail to take advantage to his full ability. The human scrap heap of discouraged, discontented and worn out men is but a sorry return for our modern industrial system.

If we believe that "for each man some line (of work) can be found in which he is first class," it imposes upon us the duty of acting in conformity with our belief. In addition it is sound business. Committed from early days to a policy of "scientifically selecting, training, teaching, and developing the workman," in plants adhering to this principle it is the customary thing, therefore, to find operatives who are now doing excellent work on their third, fourth, or even fifth trial after having previously been unsuccessful at work for which even they originally thought they were best fitted. We naturally expect to find, and do actually find, numerous cases of promotion from the ranks. Starting with the original functional foreman inappropriately called the disciplinarian, now developed into the modern functionalized Employee's Department (known variously also as the Personnel Department, the Labor Department, the Employment Department, etc.), there is set up not only a means for bringing to pass such conditions as those described above, but also a means to establish and maintain a more intimate personal touch between management and men, and to modify or counteract the tendencies on the part of the foremen and the production officials generally to press for high production regardless of the best interests always of the individual, and on the part of the employees to go to the other extreme. This department is so constituted that it sits in judgment over the employee on the one hand and the management on the other—acting as buffer, as it were, between the two. The very recent widespread adoption of this safety valve is a decided step in the right direction and has far-reaching possibilities in capable hands.

F. FREE SCOPE FOR INDIVIDUAL INITIATIVE AND OPPORTUNITY FOR ADVANCEMENT

"Democracy in industry" has been defined as existing where conditions are such as described in the above title. Whether we agree that this is a sufficiently comprehensive viewpoint or not, certainly this degree of "industrial democracy" should constitute the minimum for which we should strive, and is necessary for true progress. And yet even this amount is extremely difficult to obtain in modern industry, even with the best intentions in the world. Opportunity may be abundant, yet there are so many unmeasurable elements to be considered in determining advancement—so many questions of judgment and of personality and of circumstance. The best one may do is to do the best he can, in fair-mindedness and in impartiality.

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[1] Taylor, The Principles of Scientific Management, pp. 53-59.

[2] See Merrick, D. V., "Time Studies for Delay Allowances," American Machinist, June 21, 1917, p. 1061 (and preceding articles) where carefully worked out charts show proper allowances for rest and delays under various conditions.

Monotony, where monotony exists (for there is ample evidence that many for whom in their "deadly monotonous" tasks we are prone to feel compassion, do not at all envy us with our larger responsibilities), is due not so much to the unvarying repetition of recurrent operations as to the accompanying feeling that the work holds no future possibilities. Introduce the possibility and the probability of a more attractive future, and the humdrum task becomes but a stepping stone, seen in its proper relation to the whole scheme of things and eminently serviceable and satisfactory as a present means. The belief that each of us has a marshal's baton in his knapsack is no less stimulating today than it was in Napoleon's time, and the conviction that we have reached a position of status is no less deadening.

Difficult as it is, therefore, it is nevertheless vitally important that the channels of advancement be kept open and that every incentive and opportunity be given a man for bettering his position. As possibly the most effective avenue through which this is accomplished in scientific management, is functional foremanship. The requisites of the customary "line" foreman are so numerous and of such a nature as to preclude from that position all but the rather exceptionally gifted workman. Functional foremanship, by dividing among several foremen the duties ordinarily expected of the one, introduces greater opportunity for the man of limited or specialized talent and at the same time does not lessen the demand for those of greater or more balanced capabilities.

For the most part, since this topic is so closely allied to the preceding one where the provision for definitely teaching and guiding the employees was discussed, little additional emphasis is needed here. Before passing on, however, a prevalent fallacy in regard to the limitations placed on personality in these plants should be noted. The idea is frequently expressed that in working under highly standardized conditions and with detailed instruction and supervision from above in regard to methods, there can be little chance for the exercise for one's individuality.

I believe it has been conclusively demonstrated in practice that scientific management is decidedly a *dynamic* movement, governed not by inflexible methods and case-hardened mechanisms, but solely by *principles*. There have certainly been new developments from time to time sufficient to prove that there is a ready acceptance and adoption of better ways immediately they are proved. But, and here is the point, they must be *proved;* for it is no less a waste to be constantly upsetting carefully worked out methods upon the insistence of those who, because they have not first mastered present ways, have little right to an opinion at all as to their relative efficiency, than it is to refuse to adopt new and better ways when they are found. We do not and it is right that we should not let a novice tamper with a new and delicate mechanism until he has proved that he has mastered it.

The complaint to this extent, therefore, is well founded. It is not individuality and initiative run wild, however, which is really constructive; it is intelligently applied individuality, and prerequisite to this is an understanding of things as they are and why they are so. Founded on laws based so far as possible on *fact* from whatever competent source obtained, and administered through a democratic form of organization which draws its various functionaries from the ranks of the workman, scientific management embodies "management sharing" on a basis and to a degree infrequently encountered in industry today.

G. REDUCTION OF LABOR TURNOVER

It is unnecessary to review either the extent or the evil effects of undue labor turnover. Much has been written on the subject, recent experience has made us familiar with its prevalence, and but brief discussion is necessary here.

Much of the restlessness in industry is curable. It is due to the existence of unsatisfactory conditions in just those features of management discussed in the preceding topics—to low wages, to long hours, to poor working conditions, to lack of proper selection, fitting, and training, and to a conviction on the part of the employee that for him his present job in his present place offers no future. Naturally, therefore, with the removal of the causes in any particular place the evil itself largely disappears. This has been the experience in numberless plants which have adopted advanced measures more or less completely, and the testimony to this effect is in nowise limited to the particular group of industries we are here considering. The simple fact that their adoption with the accompanying low labor turnover are characteristic of scientific management plants to a high degree, as is proved by their records, is what primarily concerns us at present. Although the amount of turnover has increased probably without exception during the last three years, it has noticeably been kept within bounds, comparatively, in plants of this type. Upon the introduction of labor-saving devices and methods where increase in sales has been insufficient to enable the retention of the whole previous force, the policy has been adopted of securing an eventual net reduction in personnel, through filling the places of those who voluntarily leave, from the ranks of the resultant force trained, as before mentioned, to perform several different operations.

H. A SPIRIT OF COÖPERATION AND CONFIDENCE, AND A FEELING OF SECURITY

As a result of all of the positive products of advanced management enumerated above come the last and most important of them all. Indeed so important is the spirit of coöperation and confidence and the feeling of security on the part of the whole personnel that nothing should be allowed to undermine them; for without them, although a certain *efficiency* may be obtained, true *scientific management* is impossible.

Coöperation may be obtained only by securing the confidence of those with whom we deal, and this confidence in turn results only when each man feels secure in the belief that he is in the best possible place for him and that he need have no fear for the future as long as he fully plays his own part.

Needless to say a feeling of security is not engendered by rate cutting, by low wages, by long hours and poor working conditions; it does not spring from paternalism nor from leaving in the hands of the foreman—the most directly interested party—the arbitrary power of promotion, reprimand, demotion or discharge with the often resulting nepotism and favoritism, not to say despotism. A sense of security is not furthered through a feeling on the part of the operative that not only is his training, development and guidance neglected by the management, but that even though he may try hard himself, there is yet little chance for him to secure just recognition. An overemphasis of the profit motive does not lead him to feel that he will not some day be forced to choose between the employer and his own self respect or his own best interests. Security does not accompany such conditions.

Confidence and an open mind is not established through haphazard methods of manufacture (for which the capable workman at heart has a profound if respectful disgust); low wages and high costs, which he knows are unnecessary, do not impel respect for the management, when he knows they are caused by the nonuse or the misuse of equipment, of labor and of materials which he sees about him and which he knows it is the management's responsibility to remedy. Industrial strife does not inspire in the workman confidence in a management which, as he knows, usually brings it on through shortsighted or selfish dealings. No great respect for the ability of his leaders is awakened when he realizes that they know less about what constitutes a proper day's work and how to bring it to pass than he does—when, in other words, the leader knows less in this respect than the led. Only when the management really assumes its full share of the work and the responsibility may his confidence be secured.

And only through making this security and this confidence an actual fact has scientific management been able to produce what it so highly prizes and what it has so remarkably obtained—true coöperation.

We may thus distinguish several marked characteristics and accomplishments of Scientific Management. The first is its stability—the fact that it has progressed through the stages of novelty and exploitation to that of permanence. The second is its marked contributions to purely economic factors such as increased production and decreased cost, improvement in quality, a more rapid capital turnover and the stimulus to industry in general resulting from the sound foundation of knowledge on which it is based. The third is its equally striking but far more important contributions to the field of human industrial relations in the success with which it has maintained industrial peace, increased wages, improved working conditions, established proper employment and training facilities, stimulated and provided for a larger individual opportunity, reduced labor turnover and secured true coöperation between management and men.

Such are some of the notable constructive accomplishments of the science of management in the field of industry during the thirty years or less of its development.

COST OF LIVING IN RELATION TO WAGE ADJUSTMENTS

A RESEARCH MADE AT THE HOLT MANUFACTURING COMPANY, INC., PEORIA, ILL.

Under the Direction of Ray M. Hudson[1]

BY LEROY D. WILLIAMS AND ALFRED B. HOLT

FOREWORD

THE increased cost of living has had more discussion recently than almost any other subject. Numerous articles, comments, editorials, "reports" and cartoons have appeared on this subject; yet in reviewing these it becomes a difficult matter, due to the widely varying statements made and figures given, to draw definite conclusions on which to base wage adjustments for a particular industry operating in a certain community. Analysis of the information collected from these many sources shows wide variation in the data and in the conclusions, because of:

(a) Investigations made in one locality, and therefore neither truly representative of general conditions nor directly applicable to any other locality;

(b) Investigations covering the increase on only one, or two, perhaps three, of the essential factors in the cost of living;

(c) Investigations considering the increase on several of the essential factors of living costs, but in which each factor has not been weighted with respect to the relative importance which each bears to the total cost of living;

(d) Investigations considering the several essential factors, each weighted with due regard for its relative importance in the total schedule, yet failing to consider the various articles in that factor by their relative weights or values with respect to the true importance of the particular article or item in the total cost of living;

(e) A marked tendency to base conclusions, as to the actual degree or value of the increase in living costs, on a review of the "price-changes," etc., over a period of time which does not permit of a fair and proper comparison.

For example, in the swing of a pendulum from one extreme to the other of its travel, there are two points, each of which is on the opposite side of the mean vertical position of the pendulum, and yet equidistant from that central position. Therefore in the swing from peace-time to war-time conditions, and back again, effort should be made to find the mean vertical position from which to measure the relative increase, or decrease, in living cost, using that central point as the base from which to make measurements and computations.

In the investigation as conducted at the Holt Manufacturing Company, while we have confined our study to local conditions, and have made an exhaustive study for the purpose of finding a period of time when conditions were normal, or balanced, for use as a base year; and while we have further considered all the essential factors entering into the basic cost of living, and have weighted these with due regard for their relative importance in the total schedule; we have gone still further, and considered the relative weight of each particular article or item with respect to the extent that article or item enters into the specific factor of which it is a part or component.

Yet this report does not cover—and it is not intended that it should—the real causes for the increase in living cost, nor does it present any suggestion as to how that increase can be reduced. Our whole object, as brought out by the statements and data presented, is primarily:

(a) To determine that period of time or base year on which our comparisons may be established;

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[1] Manager, Department of Methods and Personnel.

(b) To set up, and adopt, a standard method for readily making further comparisons as time goes on;

(c) Then by that method, to find out what the relative percentage of increase in living cost has been;

(d) And, with that percentage as our guide, determine whether or not the advance in the daily earnings of the various classes of workers has shown the same relative percentage of increase as has the cost of living;

(e) If any classes have not been advanced proportionately, then to adjust the rates for such classes to the extent due them through those findings.

It is plainly evident throughout the report that it does not, in any manner, attempt to establish the requirements of the average family, or any specific sum to meet those requirements. It is in no respect an attempt to establish a minimum wage. Neither is it designed to act as a guide in establishing a *minimum wage* for the workers in our plant or in any other. Consequently any figures given are merely for the purpose of arriving at the relative percentage of increase on the essential factors of living cost from the period which we have accepted as being normal to this community, to the present time.

It will be noted that in this report we have considered unvarying quantities of food, clothing, fuel, etc., throughout the years covered by our research, and that we have not made deductions for the reclamation or salvage of food or clothing. Yet we all know that every thrifty family does considerable work of that nature. Neither have we made any special allowance for the purchase of sundry articles or expenditures for various items not included in the specific factors chosen as basic or fundamental ones. Such items as medical care, education, and amusements are provided in a varying degree, in many families, from the wage-earner's income. And the reason for that omission is, that while such allowances should be made in establishing a minimum wage, they *are not strictly pertinent* to the determination of the *relative increase in living cost.*

Our findings show an average of 80% excess in living standards over wage paid for the various years, including 1913, which is the year we have chosen as our base. This is no doubt because quantity requirements as given us were highly exaggerated over actual quantities used, and because of the omission of the factor of salvage and reclamation. However, this excess did not affect our final conclusions as to the relative percentage of increase, for the percentage of increase in the past six years has been just as great on one pound of any specific commodity as it has been on any fraction or multiple thereof.

Therefore the percentage of increase, as determined herein, we do claim is properly representative of conditions existent for the average worker in our plant and his family. This percentage of increase may be useful in wage adjustments in our own community, but not for other localities. For other communities we recommend an investigation similar to this in methods, but the conclusions should be based solely on the findings with respect to the actual variations and changes occurring in the locality of the investigation.

RAY M. HUDSON,
Manager, Department of Methods and Personnel

REPORT ON COST OF LIVING IN RELATION TO WAGE ADJUSTMENTS

I. INTRODUCTION

Among the constantly recurring topics of the day there is none of so much concern to us all as the cost of living in relation to wage adjustments. Every one of us has been forced to reckon with this problem either from a personal or managerial standpoint. The trend of events indicates that this issue is one which cannot be dodged, but must be faced fairly and squarely. The point at issue is whether or not "Wages should be adjusted with due regard to the purchasing power of the wage and to the right of every man to an opportunity to earn a living at fair wages, to reasonable hours of work and working conditions, to a decent home, and to the enjoyment of proper social conditions." (See question 8 in Referendum No. 27, on the report of the Committee on Industrial Relations, regarding Principles of Industrial Relations issued April 16, 1919, by the Chamber of Commerce of the United States). Many will recognize the foregoing paragraph No. 8 in the Declaration of Principles of Industrial Relations. The arguments in the affirmative as deduced from the answers state:

"Adjustment of wages as recommended in the eighth proposition places the wage standard upon an equality with the American standard of living. Compensation which does not permit the recipient to have his part in the life of the typical American community—and for a part in such life a wage adjusted as is suggested is essential—means immediate public detriment in that it creates an element which is apart, and it may mean an eventual public charge for the maintenance of persons rendered incompetent for any industrial service through the inadequacy, by this test, of the wages they have received. The adjustment of wages that is suggested is likewise of importance to individual industries which, in the long run, are dependent for stability and permanence upon contented workers with a sense of well-being according to the standards of the community. Without such conditions an industry cannot have among its personnel the esprit de corps which is essential for both quantity and quality in production.

Adjustment with due consideration of purchasing power will necessarily take into account the fluctuating value of money. The wage is customarily expressed in dollars and cents. Because of changes in the purchasing power of money, a wage which at one time was generous may become insufficient. Changes of this kind in the past three years have been marked, and wages have been widely readjusted, with degrees of accuracy that cannot be ascertained. In 1918 the Railroad Wage Board reported that the changes had been especially burdensome upon persons with small incomes and that, in order to have the same wage in 1918, a man who received $85 a month at the first of 1916 should have an increase of 40%. A more recent independent inquiry resulted in a conclusion that between July, 1914 and November, 1918, the cost of living for wage-earners in representative American communities advanced 65% to 70%. Even under very favorable circumstances the purchasing power of money can return only slowly to the level of 1914. To this circumstance, and the great changes that occurred during the war, due regard must be given in comparing money wages of earlier years with the wages that are adequate today.

That wages should be kept adjusted to their purchasing power is important from another point of view. Wide markets are essential to industrial success where industrial achievement is in great output at low cost. Such markets are created by workers as consumers. The great domestic markets of the United States are made by the workers. Per capita they consume more of the products of industry, and in greater variety, than the people of any comparable country. When industry itself is based upon the ability of wage-earners to buy its products, it is dependent upon purchasing power of the wage being unimpaired. An abundance of consumable articles with purchasers ready to acquire them brings prosperity."

Arguments in the negative state:

"This prosperity may be a paraphrase of the standard often expressed as a living wage. Living wage is a rather loose term which probably means a wage sufficient for the necessities, comforts, luxuries and conditions to which the normal individual has become accustomed. Accordingly, the living wage is not by any means a universal standard but differs widely. Moreover, in such a country as the United States these differences are accentuated by dissimilarities in race so marked as between negroes and whites and by variations among immigrants from many lands where they have divergent standards which still remain as their background.

In so far as the proposition may imply that wages should be determined by the standard of living it might not rest upon a sound basis. High wages do not arise from a high standard of living; they depend fundamentally upon effectiveness in the application of labor,—upon its being highly productive. Improvement in the arts, increasing capital, and greater productivity of industry are the sources of high wages and of the prosperity they connote.

The purchasing power of which account is to be taken is difficult to ascertain. The relative importance of articles, including the necessaries of life, varies for persons of differing incomes. Changes in purchasing power of a wage cannot be exactly ascertained. At best, index figures of prices only approximately reflect changes in the purchasing power of the wage in the hands of a worker. Besides, he frequently can evade an increase in the price of an article, at least temporarily, by substituting another.

Finally, it might be appropriate to recall that purchasing power of money has apparently reached its low mark and is now increasing. At the time of the Civil War, the low point—i.e., the time of highest prices—was in 1864. A difficult question may soon arise, as to whether or not wages increased with the decrease of purchasing power should be decreased as purchasing power grows. Such a question should not be asked from the point of view of the employer, but of the public which in large part has incomes that did not greatly change with the rise in prices and which is accordingly vitally interested in having all prices, including the wage item in prices, proportionately reduced."

As for the relative merits of these opposite points of view, the National Metal Trades Association issued their bulletin of May 10th requesting all members to give careful consideration to this principle as well as the others covered in the Referendum, and then in the bulletin of May 17th went on record as opposed to this principle for the following reasons:

(a) "Incomplete form in which the principle is stated.

(b) There is no reference to production. Wages must first of all be based on production—we must produce before we can divide or exchange. Fundamentally, wages must be based on production, and if there is enough produced, then it may be possible to carry out the provisions recited in the principle.

(c) As the principle reads, it seems based on the inclination of the employer or the employee, or upon possible legislative enactment without regard to where the money is coming from. The objects aimed at in this principle are very desirable provided they can be earned by individual production. To satisfy them otherwise, is a plain violation of natural laws."

It is not our purpose to go deeply into the economic phases and aspects of this problem, but merely to state that cost of living is the great cause of dissatisfaction throughout the world to-day. In Central and Eastern Europe it is the difficulty of getting food, regardless of the nominal price, but that is only another phase of the same problem, for high prices are partly at least a result of scarcity. European cables have monotonously reported strike after strike, the cause of which was cost of living or scarcity of goods.

It is said to be first of all a problem of scarcity, and there is no possible way of correcting scarcity except through greater production. Every interference with production, by strike or otherwise, obviously merely aggravates the trouble. When workmen go on a strike and cease producing goods, as a protest against the scarcity of goods, they are simply intensifying the condition they protest against. *Production is the only possible remedy. Every interference with production makes it more difficult for people of small means to get stable goods.*

The universal recognition of this fundamental fact will come only with an educational campaign, broad enough in its scope to reach the minds of all concerned with the main problem of production. There is no better place to begin such a campaign than in our own factories and among our own workmen, and it is plainly up to the management to take the initiative. This means a careful analysis of the wage-conditions, due regard being given to the current purchasing power of the dollar, and practical application of our findings to the solution of our own problem. We believe it fair and practical to "give more in order to get more," and in the recognition of the relative increase in living cost, as compared with the relative increase in wages in any given period, we are only laying the foundation for better conditions and better relations between men and management, which in turn will lead to the ultimate end of maximum production from any given set of conditions or facilities; and for the coincident results, such as maximum wages, minimum costs, low labor turn-over, equitable profits on capital invested, and mutual success and satisfaction to all concerned, viz; the worker, the manager, the owner, and the community of which these three are members.

If we do not recognize this factor in our wage relations, then we are bound to pay for it one way or another. Briefly, when an individual finds his income does not permit him to maintain the standards of living to which he has been accustomed (to say nothing of reaching the higher standards which human nature inherently desires as men advance in years), he soon gets into a frame of mind where he is torn between (a) lowering his standards of living by omitting certain articles of diet—making the old suit last another year, moving to cheaper quarters, or practicing other economies or substitutions—and (b) "hitting the boss for a raise."

It seems that the individual does not let himself be "torn" very far in either direction. He quickly acts in the direction of "b", and if the answer is not favorable or not promptly given, individual dissatisfaction soon arises, and like the proverbial bad apple in a barrel of otherwise good ones, he soon contaminates the others. The manager soon sees an element of unrest increasing; strikes may, and in fact, do follow as witnessed by the hundreds of them occurring of late, all of which have had as their motive, or at least a part of that motive, the "recognition in wages of the increasing cost of living." Why then should we overlook the obvious, or dodge the inevitable? Should we not expect to meet the increasing cost of labor as we do the increasing cost of raw materials by providing in the selling price of our respective products a suitable margin for increased labor costs, which in the main will, and do result, more from increased cost of living than from any other cause?

In our work at the Holt Manufacturing Company we have attacked the problem from the foregoing angle, and in the following description of the work done, it is our effort to establish:

(a) A fair and logical method which can be standardized and used as a basis for future action;

(b) A true regard for the facts in the case;

(c) A policy of dealing with our labor in such a manner that neither they nor we can take any action likely to disarrange the harmonious relations between management and men, without knowing before such action is started that it is detrimental to, if not "suicidal" for, the side that starts it.

II. OUTLINE OF METHOD

1. Reference reading on the subject.
2. Determination of base year.
3. Determination of items entering into basic cost of living.
4. Preparation and submission of questionnaires to workmen.
5. Determination of size of average family.
6. Determination of kind and quantity consumption of articles entering into each item of basic cost of living for average family.
    (a) Food.
    (b) Clothing.
    (c) Fuel and Light.
    (d) Shelter.
7. Computation of cost of living from results of operation No. 6.
8. Tabulation of results of operation No. 7.
9. Computation of average wage rate for years considered from Holt pay roll records.
10. Tabulation of results of operation No. 9 according to average rate of wages and years.
11. Computation and charting of results of operations No. 9 and No. 10 on percentage basis using base year as zero point.

III. DESCRIPTION OF WORK DONE

A. GENERAL DATA

1. DETERMINATION OF BASE YEAR

Determining the cost of living with the idea of using it as a basis for wage adjustments, involves the following principal steps:

(1) Determining the relative increase or decrease in cost of living;

(2) Determining the relative increase or decrease in wages;

(3) Comparison of the trend of cost of living and trend of wages;

(4) Adjustment of wages in instances where wages have not advanced as rapidly as the cost of living.

In the problem of determining the cost of living, the point that must be settled before steps may be taken towards the solution with any degree of certainty, is that of finding the base year. It can readily be seen that no progress can be made towards drawing a comparison of cost of living and wages, until a time can be found as a starting point, when the two factors were equitable.

The ideal date would be that time when the cost of living and wages were stabilized and equal. However, until the investigation has actually been made, and the two factors are known, the exact date on which they were equal cannot be determined. There are certain conditions, however, which would reflect such a time. Such a time would exist only—

(1) When conditions are normal;

(2) When wages are settled and employment regular;

(3) When workmen are apparently satisfied as indicated by the absence of strikes and other disturbances;

(4) When prices of food and other essential items of living are neither excessive nor fluctuating.

The above conditions must be considered first generally and then locally.

The Holt Manufacturing Company's plant in Peoria has been in operation only since 1910, and production was hardly begun until a year later; the further fact that factory records were incomplete until about the beginning of 1912, makes it impracticable for our purpose to attempt to analyze conditions prior to 1912.

Conditions in 1912

In an article in the *Saturday Evening Post*, entitled "To Keep the Wheels Turning," by Will Payne, the statement is made that the industrial high water mark in the United States was reached about the end of 1912, at which time—

(1) Railroads were moving 2,000,000,000 tons of freight;

(2) The making of pig iron had arisen to 30,000,000 tons. (Both of the above were record figures).

(3) The Steel Corporation had unfilled orders on its books to the amount of 8,000,000 tons;

(4) Such data as were available showed that labor unions had full employment.

The Bureau of Labor Statistics shows that the purchasing power of union wages in 1912 was practically the same as that for the previous year.

In the Holt plant for the year 1912, daily wages were normal and uniform. There was little labor turnover and the number of employees steadily increased.

Conditions in 1913

The industrial high water mark previously mentioned, which was reached by the end of 1912, extended over into the early part of 1913.

The Bureau of Labor Statistics shows that the food purchasing power of union wages was the same for 1912 and 1913; also that wages generally throughout the country increased slightly during 1913. Bulletin No. 214 of the Bureau of Labor Statistics, in summarizing wage changes of 101 labor trades, shows that in 1913 wages increased slightly in 75 per cent of the cases.

The National Industrial Conference Board, No. 15 Beacon Street, Boston, Mass., refers to 1913 as an average year, and has accepted 1913 as a satisfactory pre-war standard.

Our own factory records show that during the first six months of 1913, wages were normal and generally constant; also, that the number of employees did not increase as rapidly as in 1912, but remained practically the same for the whole six months.

Investigation of conditions in other plants in Peoria and vicinity indicates that the conditions found in the Holt plant were likewise to be found in other plants. The investigation also shows no unrest locally during this period.

Conditions in 1914

During the latter part of 1913 and the early part of 1914, the whole country was disturbed by unemployment conditions. The situation was probably most acute in New York City; however, it extended throughout the middle west and the whole country in general. The industrial high water mark reached in the early part of 1913 was showing a gradual decline and by the beginning of 1914, according to the statement of Will Payne, unfilled orders on the books of the Steel Corporation had fallen to 4,000,000 tons against 8,000,000 tons the year before; bank clearings were shrinking and labor union records were showing increasing unemployment.

In September, 1914, out of 6,000,000 organized wage-earners in reporting unions, 100,000 were reported idle, this being the greatest number for seventeen years.

By the beginning of 1914, the monthly output of pig iron had fallen to less than 2,000,000 tons against 2,750,000 a year prior. By November, 1914, the monthly output of pig iron had fallen to 1,500,000 tons, and the Steel Corporation's unfilled orders had shrunk another million. In December, 1914, the steel mills of the country were running at one-third their capacity, bank clearings had declined more than one-fifth, and railroad revenues were running far behind.

By the end of 1914, the unemployment problem had become a serious one throughout the United States, and it is estimated that several million wage earners were out of employment.

The food purchasing power of union wages, which had remained level during 1912 and 1913, showed a decrease for 1914.

By the end of the year the situation had become a national issue, and the Bureau of Labor Statistics, as well as numerous other organizations, had begun making investigations with a view to arriving at some solution of the problem.

In our own plant, the decline in the number of employees, which began during the latter part of 1913, continued throughout the greater part of 1914, and by September, 1914, had reached the lowest point, there being at that time only one-fourth as many on our payroll as at the beginning of 1913. There was a little change in the wage scale, the average daily wage being slightly higher than in 1913. However, this may be explained by the fact that in laying off so many employees, it was natural that those who remained were the more highly skilled.

Conditions in 1915

The unemployment problem reached its height during the latter part of 1914, and by the beginning of 1915 was relieved on account of European war orders. These war orders did not generally effect the country until later in 1915, and as late as March and April in 1916 many of the cities in the middle west were reporting from 10 to 15 per cent unemployed, and 10 to 15 per cent more employed only part time. Prices, however, showed little increase during the early part of 1916.

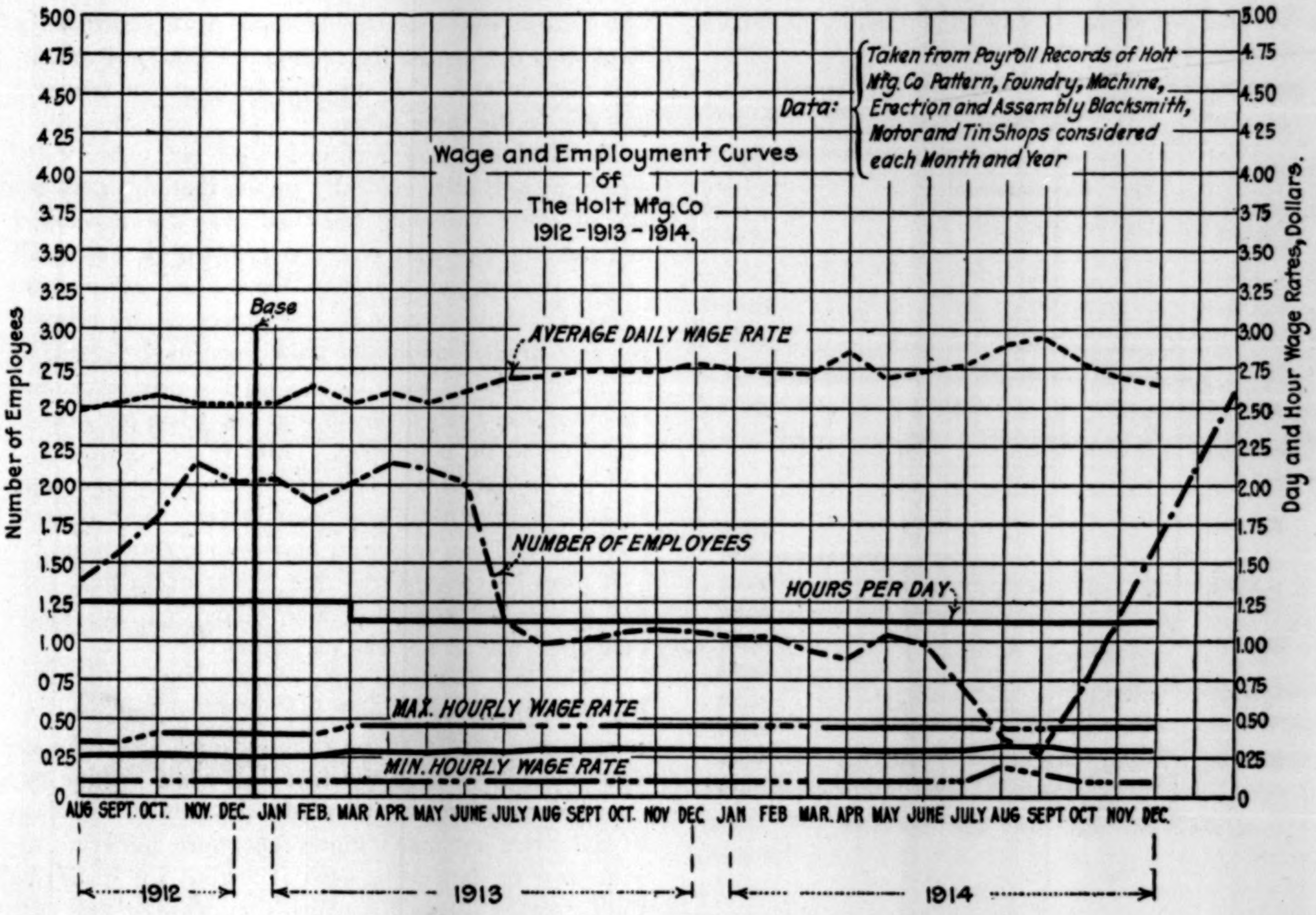

FIGURE 1

In our own plant, owing to the receipt of war orders, the number of employees during the last three months of 1914 rose from its lowest point back to normal, and continued to increase throughout 1915.

From 1915 to the present time, prices have increased by leaps and bounds, and wages have also increased. There has been a great labor turnover and men have been rapidly changing from one place to another. After the middle of 1917 men were being drafted into the Army and replaced, so that conditions were very abnormal and there was unrest throughout the country generally; and at two different times during this period there were strikes in the Peoria plant.

From the above facts it was concluded that the end of 1912 and the beginning of 1913 represents the period when cost of living and wages were most equitable, and in consideration of all these facts, the condition as found at the beginning of 1913 was taken as a base from which to determine the cost of living, as well as wage increase. (Cf. Figs. 1 and 2).

2. *THE QUESTIONNAIRE*

The questionnaire was prepared for the purpose of obtaining from employees their actual standards of living. It was our purpose to take their own standards for the essential items of living cost, rather than to set any arbitrary standards, or take such statistics and data as might have been prepared by the U. S. Labor Bureau or other agencies.

In sending out the questionnaire, the employees oldest in point of service were selected with the idea that information received from them would be more reliable, and also on account of their knowledge of local conditions in the earlier years.

Two hundred eighty questionnaires were sent out, an equal proportion being sent to each of the three classes into which the employees were divided, i.e., "Unskilled," "Skilled," and "Highly Skilled." This was done to obtain information which would reflect a fair and just average of all employees in the factory.

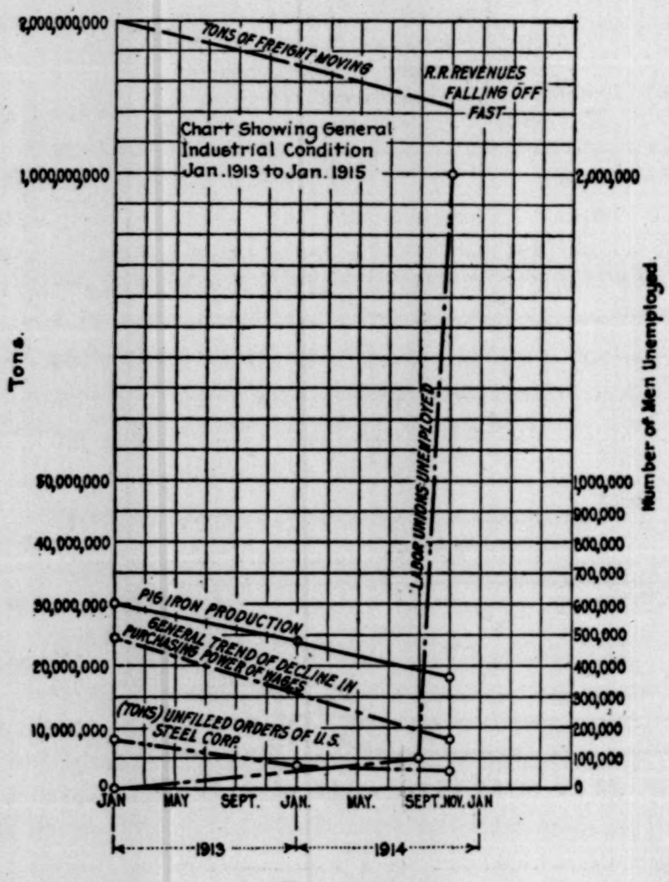

FIGURE 2

It was requested that the questionnaires be filled in and returned within one week. Approximately 45 per cent were returned by the expiration of this time. Investigation to determine why more were not returned, disclosed the fact that many were not returned for the reason that the local unions had instructed that they should not be. Later an effort was made to have additional questionnaires returned by requesting different foremen that the matter be again brought to the attention of employees under their supervision.

As a result of this, a considerable number of additional questionnaires were turned in. However, many of these were returned in blank and others returned only partially filled out.

The following table represents the final figures with reference to return of questionnaires:

	Per cent
Completely filled out	15.
Partially filled out	33.4
Returned blank	17.4
Not returned	34.2

It is believed that the 17.4 per cent returned in blank was due to the instructions of the local unions. It is also believed that the 34.2 per cent not returned was due to the same cause.

The 48.4 per cent returned filled out either completely or partially, evidently means that this percentage of those receiving questionnaires are non-union and the 51.6 per cent returned in blank or not at all means that percentage may have been union men. However, these figures do not represent the relative per cent of non-union and union men in the plant, as the questionnaires went to one-third of our force, and no effort has been made to find out what per cent is really union or non-union. Ours is an "open shop" and we do not care which element is greater, so long as both management and men respect their relative positions and can maintain harmonious conditions.

It must be remembered that it was made clear that the matter of returning and filling out the questionnaires was in no way obligatory.

The fact that local unions issued instructions that the questionnaires should not be filled out and returned was hardly to be expected and was very inconsistent, in view of the fact that while making our own investigation, we ran across the path of members of the street car men's union who were gathering the same sort of data to be used as a basis for justifying the increased wages for which they were at that time threatening to strike.

It is further inconsistent in view of the fact that unions throughout the whole country, in practically every instance where increased wages are asked, base their claim for the increase on the fact that the cost of living has increased so rapidly.

In instances where the questionnaires were only partially filled out, the portion of the questionnaire which was filled out was included in the final figures; and the data—food cost or whatever it was—were given the same weight as though the questionnaire had been entirely filled out.

In figuring the articles as well as quantities, the data given in the questionnaire were taken as final and no attempt was made either to change or modify them, i. e., we accepted the standards of their desires, and compiled our averages from these standards.

3. PLACE OF RESIDENCE OF EMPLOYEES

From the returned questionnaires, the place of residence of 150 of our representative workmen—an equal number of each class considered, that it, unskilled, skilled, and highly skilled—was determined. These data were used in the cost of living investigation:

(1) In order to select grocery stores and meat markets located in the vicinities where our employees actually lived. The prices were obtained from such stores and markets.

(2) In order to determine the relative weights to be given rental and tax increases in different parts of the city in computing the cost of shelter.

4. SIZE OF FAMILY

A summary of investigations by the Federal Bureau of Labor covering 25,440 workmen's families throughout the United States, showed that the average family consisted of five persons—father, mother and three children.

In "A Study of Families of Limited Incomes in New York City," by W. S. Gibbs, author of "The Minimum Cost of Living" published in 1917, 56 families were considered, and it was found that the average family consisted of five members.

The investigation made in Peoria in July, 1918, by the Independent Bureau of Philadelphia, under the direction of the Housing Committee of the Peoria Association of Commerce, showed that the average family in Peoria consisted of five members—father, mother and three children.

The data contained in our own questionnaire showed that the average Holt Manufacturing Company family consisted of four members—father, mother and two children.

However, in view of the fact that a consideration of the whole city showed five members in each family, and the further fact that a consideration of 25,440 families throughout the United States showed five members, and that this figure is almost invariably used by the government in its computations, we have concluded that a family consisting of the father, mother and three children should also be considered in our investigation.

This, at any rate, gives the benefit of the doubt to our employees.

The Eighteenth Annual Report of the United States Commissioners of Labor considers the consuming power of the different members of the family in the following proportion:

Man	(17 years or over)	1.00
Woman	(16 years or over)	.80
Boy	(16 years or over)	.90
Boy	(12 to 15 yrs. incl.)	.80
Boy	(10 to 11 yrs. incl.)	.60
Girl	(14 to 15 yrs. incl.)	.70
Girl	(10 to 13 yrs. incl.)	.60
Child	(6 to 9 yrs. incl.)	.50
Child	(2 to 5 yrs. incl.)	.40
Child	(Under two years)	.30

These figures are the accepted dietary standards as set by Professor Atwater, of the U. S. Department of Agriculture, and are used by the Department of Agriculture in all its computations. These figures were also used by W. S. Gibbs, in *Minimum Cost of Living.*

In our computation we have taken the following as an average family: father, mother, boy age 15 years, boy age 9 years and girl age 7 years. By using the above table showing consuming power of such persons, we find that our family consists of 3.6 adult males.

B. SPECIFIC DATA ON LIVING COSTS

1. FOOD

Menus

The data contained in the returned questionnaires were used in determining the average typical menu for each meal. All articles of food appearing in these questionnaires for each meal during the four seasons were listed, and the number of times each appeared was noted. Articles appearing in any certain meal in as much as 50 per cent of the cases were included in the average typical menu without further questioning. However, articles appearing in menus in less than 50 percent of cases were divided and one article was included in that meal for one season and the other article included in the same meal for the next season.

For instance in thirty menus for:

January 15th:		*April 15th:*	
Eggs appeared	12 times	Eggs appeared	22 times
Bacon	10 times	Bacon "	8 times
Potatoes "	13 times	Potatoes "	15 times
Rolled Oats	9 times	Rolled Oats	8 times

Consequently bacon and rolled oats were included in the typical menus for January 15th and eggs and potatoes were included in the typical menus of April 15th.

By this method, it was found that the typical menus for the four seasons of the year were as follows:

BREAKFAST	DINNER	SUPPER
	January 15	
Coffee Bread Butter Milk Bacon Rolled Oats	Bread Butter Coffee Potatoes Pot Roast Beans Pie	Bread Butter Potatoes Coffee Round Steak Onions Pudding
	April 15	
Coffee Bread Butter Milk Eggs Potatoes	Bread Butter Coffee Potatoes Stew Beef Corn Pie	Bread Butter Potatoes Coffeee Ham Peas Bananas—Cake
	July 15	
Coffee Bread Butter Milk Eggs Potatoes	Bread Butter Coffee Potatoes Round Steak Cabbage Pie	Bread Butter Potatoes Coffee Pork Chops Onions Rice Pudding
	October 15	
Coffee Bread Butter Milk Eggs Rolled Oats	Bread Butter Coffee Potatoes Pot Roast Beans Pie	Bread Butter Potatoes Coffee Round Steak Corn Cakes

Quantities

On the questionnaire space was allowed in which to show the quantity consumed of each article for each meal. In many cases the quantity was not given us by the workers, possibly because of their never having considered food consumption from this angle. To get around this difficulty, the amount of each article of food consumed each day by the typical family was carefully computed and estimated from such data as were given by the employees in the questionnaires, from consultation with house-wives, from reference to standard cook books, and from the table above cited.

Prices

Prices of each article of food for the four seasons of the years 1913, 1915, 1917, 1918 and 1919 were obtained from grocery stores and meat markets located in parts of towns where the investigation showed our employees lived.

From these prices an average price for each article of food was determined for the four seasons of the years considered and these average prices were used in our computation.

While it was found that from 7 to 25 per cent could be saved by marketing at the "cash and carry" type of stores down town rather than at stores where charge accounts are kept and regular delivery systems maintained, the prices at the "cash and carry" stores were, however, not considered in our computations, for investigation proved that the larger number of workers have accounts, subject to weekly settlement, at various stores; and the number patronizing "cash and carry" stores could not be taken as indicative of true conditions. Why it is that people prefer to lose the amount they might save in this way is a peculiar thing. Perhaps it is because of the personal inconvenience involved in the "cash and carry" plan.

Using the articles of food, quantities and prices as above obtained, the daily food cost of our average family for the four seasons of each year, 1913, 1915, 1917, 1918 and 1919, were computed. Summary results are shown in Table 1, as follows:

TABLE 1: SUMMARY OF FOOD COSTS

Date	1913	1915	1917	1918	1919
(A) Jan. 15	$1.3145	$1.6601	$2.0975	$2.7181	$2.9133
(B) Apr. 15	1.8206	2.0712	2.9698	3.0989	3.4877
(C) July 15	1.5666	1.6997	2.4244	2.653	
(D) Oct. 15	1.7208	1.9790	2.7083	3.091	
(E) Average	1.6056	1.8525	2.55	2.8902	3.2005
(F)*Average cost per day for (300 days)	1.9534	2.2538	3.1025	3.5164	3.8939
Percent increase over 1913	0	15.4%	58.3%	80%	99.3%

$*F = \frac{E \times 365}{300}$. Inasmuch as there are only 300 working days in a year, the cost must be computed on a basis of 300 days, i.e., a workman must earn sufficient in 300 days to support himself and family for the 365 days.

2. CLOTHING

The data showing the articles of clothing and quantities for each member of the family for the years 1916, 1917 and 1918 were compiled in detail, to determine the articles of clothing and quantities used by our average family.

Each article and the quantity used by each person for the three years was entered and the total quantities divided by the number of cases considered to find the average consumption per family for each year.

All articles included in the questionnaire were considered in the final clothing schedule with the exception of those articles reported in a very limited number of instances.

The following tables represent the articles and quantities used annually by each member of our average family of five:

MAN

Article	*Qty.*	*Article*	*Qty.*
Suit	1.6	Hats (Straw)	1.
Shoes	3.2	Overcoat (3 yrs.)	1.
Underwear		Overalls	4.
(Hvy. Wool)	2.3	Caps	1.5
(Light)	2.3	Neckties	8.
Handkerchiefs	12.6	Collars	9.9
Socks	13.3	Gloves	1.8
Shirts (Dress)	2.7	Work Pants	1.8
Shirts (Work)	4.	Night Shirts	2.
Hats (Soft)	1.	Rubbers	1.

WOMAN

Article	*Qty.*	*Article*	*Qty.*
Suit	1.6	Handerchiefs	15.
House dress	3.8	Corsets	2.
Hats	2.	Corset Covers	5.4
Shoes	3.	Petticoats	5.8
Underwear		Gloves	2.4
(Heavy)	2.5	Aprons	5.4
(Light)	2.5	Coat (3 yrs.)	1.
Stockings	8.6	Night Gowns	5.
Shirt Waists	3.6		

BOY 15 YRS.

Article	*Qty.*	*Article*	*Qty.*
Suit		Pajamas	2.
(long pts.)	1.	Linen Collars	8.
Overcoat		Neckties	10.
(2 yrs.)	1.	Sweater	1.
Shoes	3.	Underwear	2.
Stockings	12.	Hats	2.
White Shirts	2.	Cap	1.
Flannel Shirts	3.		

BOY 9 YRS.

Article	*Qty.*	*Article*	*Qty.*
Suit	2.	Underwaist	2.
Overcoat (2 yrs.)	1.	Hats	2.
Shoes	6.	Rubbers	3.
Flannel Waist	3.	Stockings	12.
Sweater	1.	Underwear (Hvy.)	2.
Gingham Waist	6.	Night Shirts	2.

GIRL 7 YRS.

Article	*Qty.*	*Article*	*Qty.*
Coat	2.	Skirt	8.
Hats	2.	Dresses	8.
Stockings	12.	Underwear	4.
Shoes	4.	Hair Ribbons (per yd.)	6.
Rubbers	3.	Underwaists	2.
Pants	6.		

Prices were obtained from three of the leading merchants in Peoria for the years 1913, 1915, 1917, 1918 and 1919 on the above articles of clothing, care being exercised to see that prices were quoted on styles and grades that usually are purchased by workmen's families, and that prices on the same or equivalent grades of articles were quoted throughout all the years.

In computing the cost, the average of the prices quoted on each article by the three merchants was taken as the correct figure to use. The summary of the computation is indicated in Table 2, as follows:

TABLE 2: SUMMARY OF CLOTHING COSTS

	ANNUAL COSTS				
	1913	1915	1917	1918	1919
Man	$ 87.35	$ 96.72	$119.86	$151.52	$160.75
Woman	124.43	136.77	165.77	210.61	239.51
Boy (Age 15)	48.50	54.06	69.80	90.75	97.90
Boy (Age 9)	48.85	53.55	68.08	94.30	103.90
Girl (Age 7)	52.35	57.35	71.66	90.26	98.79
Total	361.48	398.45	495.17	637.44	700.85
Per day*	1.205	1.328	1.65	2.125	2.336

*in year of 300 working days

3. FUEL & LIGHT

The data were tabulated to determine the cost of fuel and light for each of the years considered.

The amount of fuel and light used as specified in each questionnaire was tabulated, and a monthly average determined showing consumption of coal, gas and electricity.

The returned questionnaires clearly showed that the greater percentage of families used:

(1) Coal for heating;
(2) Gas for cooking;
(3) Electricity for lighting;

and our compilation was made on this basis.

The result of our compilation is summarized in the following Table 3:

TABLE 3: AVERAGE QUALITIES USED

Year	Coal for heating	Gas for cooking	Electricity for lighting
1913	35.5 bu. per mo.	2850 cu. ft. per mo.	24.6 K. W. H. per mo.
1915	36. " " "	2851 " " " "	24.6 " " "
1917	36.5 " " "	2750 " " " "	24.4 " " "
1918	37.5 " " "	2746 " " " "	25.2 " " "
1919	37.5 " " "	2737 " " " "	25.6 " " "
Average per mo.	36.6 bu. (25 bu. per ton)	2787 cu. ft.	24.9 K. W. H.
Average per year	17.6 tons	33000 cu. ft.	29.9 K. W. H.

All inquiry pointed to the fact that Peoria and Springfield District bituminous coal was generally used, and prices for this kind of coal were entered in our computations by taking data given by local dealers for the months in each year considered. The monthly prices were then averaged.

The rates on gas and electricity for the years considered were obtained from the local Light & Gas Company.

It will be noted that gas and electricity are the only two things on which the prices were reduced during the period considered.

Table 4 shows the average quantities of coal, gas and electricity used per year by our average family, as well as the total annual and daily cost for each kind of fuel for each year.

TABLE 4: FUEL AND LIGHT COSTS

Item	Average amount used per year	Annual Cost for				
		1913	1915	1917	1918	1919
Coal Peoria or Springfield District bituminous	17.6 tons	$46.64	$50.16	$60.19	$95.92	$89.94
Gas (For cooking)	33 M cu. ft.	29.70	29.70	28.05	28.05	28.05
Electricity (For lighting)	299 KWH	29.60	29.60	20.93	20.93	20.93
	Annual Cost	105.94	109.46	109.17	144.90	138.92
	Daily Cost	.353	.364	.363	.483	.463

4. SHELTER

The data from which we compiled our final figures on shelter were obtained from the answers to the questionnaire.

In securing our final figures, we attempted to show a comparison of the cost of ownership to the cost of renting. However, in our total cost of ownership for each year, we took into consideration combined taxes, depreciation and insurance only.

From the questionnaire we found that an equal percentage owned their homes in the north and south ends respectively, about double that number owned homes on the bluffs, and about 18 per cent owned their homes in East Peoria. In compiling our figures on cost of ownership, we selected seventeen houses distributed according to the above percentage figures.

Ascertaining the total assessments, we then took 2 per cent of this amount for depreciation. In a great many cases the men gave us only the taxes paid in 1919, and when this occurred, we figured the taxes for the other years by using the same assessments for the various years and using the old tax rates. In computing for both Peoria and East Peoria, the assessments are changed only every four years, but tax rates are changed every year. The taxes for each year were calculated from the tax rate and the assessed valuation for the year prior; i. e., 1912 taxes are actually paid in 1913.

In figuring cost of ownership, we included total taxes for each year, 2 per cent depreciation for each year and total insurance for each year. We then reduced these total figures to a daily cost by dividing the annual cost by 300, always considering that a man must earn enough in 300 working days to care for himself and family during a year of 365 days.

We then found the average monthly rentals for each year considered from the data given in the questionnaire. We averaged the monthly rentals as paid in Peoria and East Peoria for each year and reduced this to a daily rental cost. We then used the daily rental cost as the daily cost of shelter.

We find that the percentage increase of the combined taxes of Peoria and East Peoria for 1919, is 28.6 per cent over 1913, while rentals have increased but 24.3 per cent. This shows that rentals are increased in about the same proportion as taxes, but rentals are not increased as much in cases where the tenant has rented the same house for a number of years. The landlord then assumes part of this expense as he considers it more profitable to have a steady tenant than one who is moving continually.

We found that the ratio of the daily cost of ownership, including only taxes, depreciation and insurance, to the daily cost of renting was 1 to 3 in 1913, and gradually increased through the various years to a ratio of 1 to 3.37 in 1919.

5. *SUMMARY*

Combining the four principal essentials of cost of living, that is, food, clothing, fuel and shelter, we found the total daily cost of living for the years 1913, 1915, 1917, 1918 and 1919. The result was that the same articles, used in the same quantities by the standard family of five throughout those years, could be purchased in 1913 for $4.06, whereas in May, 1919 those same articles would cost $7.39, an increase of 81.6 per cent in daily living cost from the base year, 1913, to May, 1919.

C. SPECIFIC DATA ON WAGES

1. *ACTUAL WAGES PAID*

In compiling the figures on wages for the various years considered, we included only factory departments and classified these into productive and "non-productive" labor. The daily wages for each department were obtained by going through the payroll for each year and securing the daily earnings for each representative class or grade of work in that department, and then taking an average of the total grades for the daily wages of that department.

In the above manner daily wages were found for both productive and non-productive labor and the percent increase computed for each year considered. The two classes of labor were then combined and the average daily earnings computed for 1913, 1915, 1917, 1918, and also for 1919 up to May 28th. Percentage increases for 1915, 1917, 1918, and 1919 before May 28th were then computed and used in the comparisons with the increased cost of living over the same years.

2. *SUMMARY*

Investigation proved the average wages for all departments has risen from $2.48 in 1913 to $4.15 in 1919 prior to May 28th or 67.1 per cent.

IV. COMPARISONS MADE, CONCLUSIONS DRAWN AND ACTION TAKEN

Obviously if the cost of living had increased 81.6 per cent in the same period in which wages had risen only 67.1 per cent there was an adjustment due which would bring the current daily wage into the same relation with the daily cost of living in 1919 as prevailed in 1913. There was a widening gap between wages paid and actual living costs, as evidenced by the fact that conditions which were apparently equitable and acceptable in 1913 were becoming daily strained in 1919, and the general basis used by our men in justifying their individual requests on their foreman for raises was the present day "high cost of everything." (Cf. Figs. 3 and 4).

It was therefore decided by the management to put through a wage advance in recognition of this discrepancy as shown by 81.6 per cent increase in living cost, and a 67.1 per cent increase in wages for the same period.

In reviewing the payroll, it was plainly evident some classes had advanced more than others. This was due largely to the greater pressure exerted by the organized element of skilled workers, which was greater than that exerted by the unorganized element composed of lesser-skilled men. We, however, made no discrimination, but put through an advance varying from 2 1-2 to 8 cents per hour on all classes of labor employed, those receiving the largest increase being, of course, in the classes which were most underpaid, considered on this cost of living basis.

V. RESULTS

In the adjustment, our final calculations show it has cut the margin of difference between 81.6 per cent and 67.1 per cent—14.5 per cent—to a difference of 3.9 per cent—i. e., the increase in wages after the adjustment was 77.7 per cent as against 67.1 per cent before the adjustment. This difference of even 3.9 per cent was not intentional, for all classes of labor were brought up 81 per cent or better from the prevailing 1913 daily wage; but when averaging the individual rates for each man in a department, and then averaging these composite rates for all departments, the new scale ranging from $3.60 (or 45c x 8 hours.) minimum, to $7.20 (or 90c x 8 hours.) maximum, gave, when weighted by the number of men receiving these rates (or those in between) a new average of $4.41 and this is 77.7 per cent higher than the average of $2.48 for all classes in 1913. The next wage adjustment involving recognition of cost of living will, we intend, make up for this slight deficiency for we will have the benefit of this research to increase the accuracy of our aim. Further there was not the same number of men in each department in 1913 as in 1919, and this variation further accounts for the variation in the weighted average of daily earnings for the two years, 1913 and 1919, respectively; i. e., there was a proportionately greater number of low-rated men in the 1919 average than in the 1913 average, and that has had its effect in reducing the average wage for 1919 although all classes of labor have as "classes" the same relative increase of 81.6 per cent over their 1913 average daily wages.

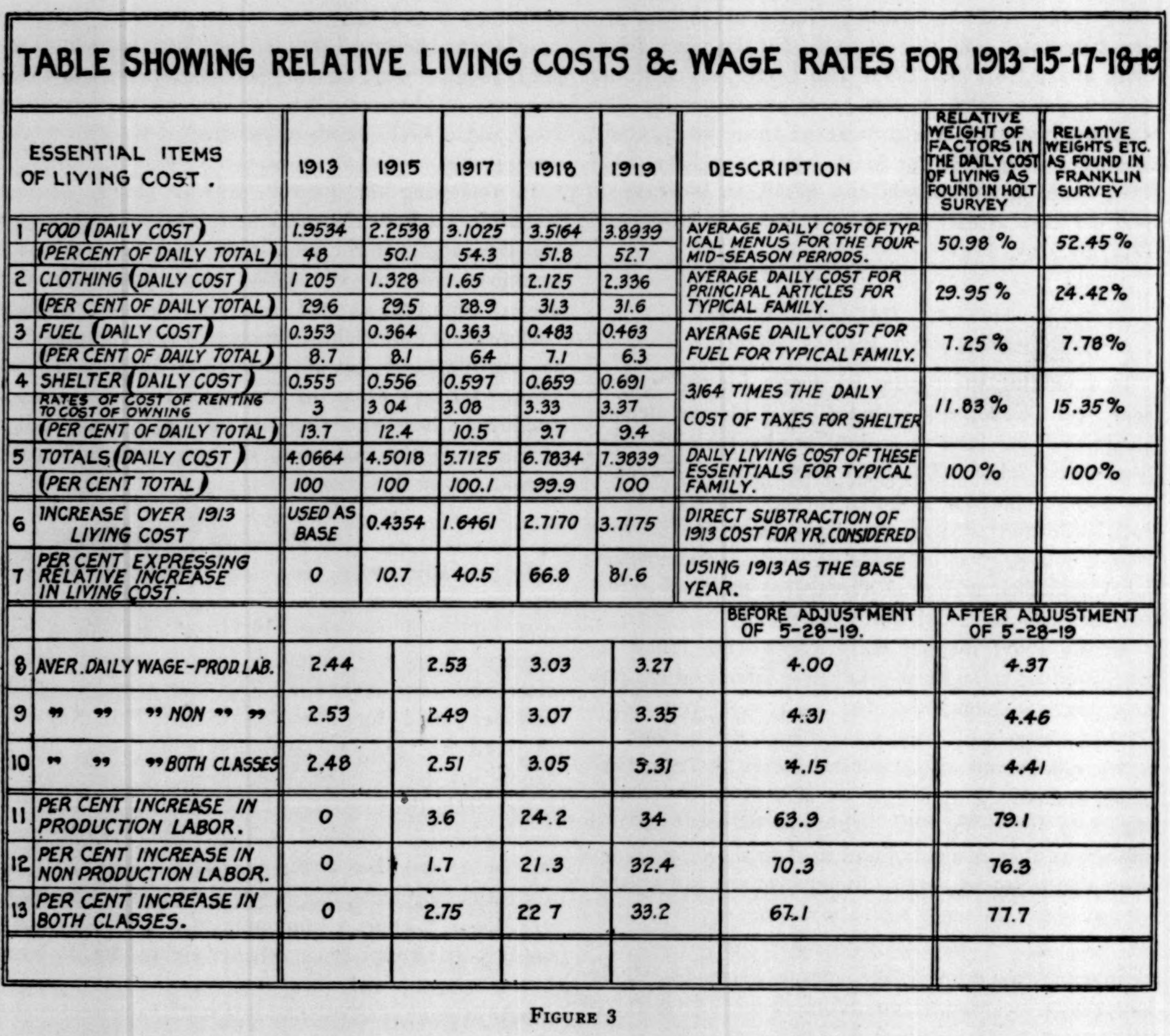

TABLE SHOWING RELATIVE LIVING COSTS & WAGE RATES FOR 1913-15-17-18-19

	ESSENTIAL ITEMS OF LIVING COST.	1913	1915	1917	1918	1919	DESCRIPTION	RELATIVE WEIGHT OF FACTORS IN THE DAILY COST OF LIVING AS FOUND IN HOLT SURVEY	RELATIVE WEIGHTS ETC. AS FOUND IN FRANKLIN SURVEY
1	FOOD (DAILY COST)	1.9534	2.2538	3.1025	3.5164	3.8939	AVERAGE DAILY COST OF TYPICAL MENUS FOR THE FOUR MID-SEASON PERIODS.	50.98 %	52.45 %
	(PERCENT OF DAILY TOTAL)	48	50.1	54.3	51.8	52.7			
2	CLOTHING (DAILY COST)	1 205	1.328	1.65	2.125	2.336	AVERAGE DAILY COST FOR PRINCIPAL ARTICLES FOR TYPICAL FAMILY.	29.95 %	24.42%
	(PER CENT OF DAILY TOTAL)	29.6	29.5	28.9	31.3	31.6			
3	FUEL (DAILY COST)	0.353	0.364	0.363	0.483	0.463	AVERAGE DAILY COST FOR FUEL FOR TYPICAL FAMILY.	7.25 %	7.78%
	(PER CENT OF DAILY TOTAL)	8.7	8.1	6.4	7.1	6.3			
4	SHELTER (DAILY COST)	0.555	0.556	0.597	0.659	0.691	3164 TIMES THE DAILY COST OF TAXES FOR SHELTER	11.83 %	15.35%
	RATES OF COST OF RENTING TO COST OF OWNING	3	3 04	3.08	3.33	3.37			
	(PER CENT OF DAILY TOTAL)	13.7	12.4	10.5	9.7	9.4			
5	TOTALS (DAILY COST)	4.0664	4.5018	5.7125	6.7834	7.3839	DAILY LIVING COST OF THESE ESSENTIALS FOR TYPICAL FAMILY.	100%	100%
	(PER CENT TOTAL)	100	100	100.1	99.9	100			
6	INCREASE OVER 1913 LIVING COST	USED AS BASE	0.4354	1.6461	2.7170	3.7175	DIRECT SUBTRACTION OF 1913 COST FOR YR. CONSIDERED		
7	PER CENT EXPRESSING RELATIVE INCREASE IN LIVING COST.	0	10.7	40.5	66.8	81.6	USING 1913 AS THE BASE YEAR.		

						BEFORE ADJUSTMENT OF 5-28-19.	AFTER ADJUSTMENT OF 5-28-19
8	AVER. DAILY WAGE-PROD. LAB.	2.44	2.53	3.03	3.27	4.00	4.37
9	" " " NON " "	2.53	2.49	3.07	3.35	4.31	4.46
10	" " " BOTH CLASSES	2.48	2.51	3.05	3.31	4.15	4.41
11	PER CENT INCREASE IN PRODUCTION LABOR.	0	3.6	24.2	34	63.9	79.1
12	PER CENT INCREASE IN NON PRODUCTION LABOR.	0	1.7	21.3	32.4	70.3	76.3
13	PER CENT INCREASE IN BOTH CLASSES.	0	2.75	22 7	33.2	67.1	77.7

FIGURE 3

In calculating the result of this voluntary action on the part of the management, we are satisfied that we have gained much desirable ground in our efforts to insure the stability of labor conditions in our own plant.

(1) The majority of our men when they received this raise, and knew the circumstances under which it was given, were highly pleased with the company's attitude. Many of them expressed their personal satisfaction to their foremen, to their fellow workers, and to their friends in neighboring plants.

(2) It further established their faith in the watchfulness of the management over the conditions affecting the workers, and showed the workers that it was not necessary for them to resort to the prevalent methods of securing attention or recognition.

(3) It paved the way for further action on the part of the management in its work of installing scientific management principles to the operation of the business, and through this practical demonstra-

tion of the interpretation of Taylor's statement that the "principal object of management should be to secure the maximum prosperity for the employer, coupled with the maximum prosperity for each employee," our men have taken hold in a hearty manner and are assisting in many ways to achieve the ideals so admirably set forth in Taylor's *Principles of Scientific Management*.

Dr. Taylor says: "Scientific management has for its very foundation the firm conviction that the true interest of the two (employer and employee) are one and the same; that prosperity for the employer can not exist through a long term of years unless it is accompanied by prosperity for the employee, and vice versa, and that it is possible to give the worker what he most wants—high wages, and the employer what he wants—low labor cost for his manufacture."

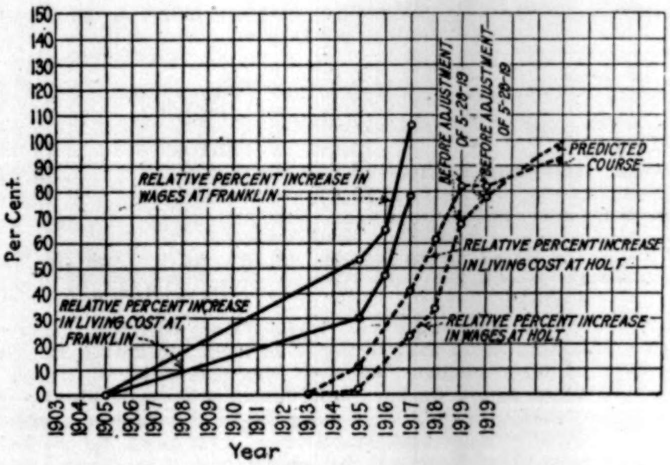

FIGURE 4

The cost of this increase, as distributed over our annual production, will be relatively insignificant, for while this wage increase averaged .0364 cents per hour applied to each of 1184 men, or expressed otherwise, it was approximately 10 per cent increase in its net effect on our annual payroll, we can see wherein the reduction of wasted effort and the practice of other economies as the result of improved methods of management will more than compensate for this increase.

But this is not the end of it all! By standardizing our method, and by semi-annual or quarterly review of the changing prices, we will continue to make adjustments in recognition of the cost of living whenever conditions warrant such action. In other words, it will be treated as a perfectly proper and legitimate factor in our business affairs.

There are, of course, many other factors in the wage problem, such as the recognition of the relative value of each worker.[1] This is evidenced by his output or rate of production; his spoilage, or degree of inaccuracy in his work; his attendance record; his versatility as indicated by the variety of major processes which he can do or operate without instruction; his years of continuous service; and further, his conduct and coöperation; and we are working now to establish recognition of these factors in the rating of each of our workers. These, however, must be reckoned with on the individualistic basis, and should be applied only after cost of living has been considered. It is absurd to expect workers to produce more and maintain a high quality of production, or even be content to stay with any company where the wages paid to him do not permit him to approach the standards which he sets for himself in regard to what he shall eat, what he shall wear, and how he shall live.

The cost of living has come to stay as a factor in the present day wage problem; and the sooner it is recognized, studied, and acted on, the sooner we will all see reduction in the present unrest and a return to more stable conditions.

VI. SUPPLEMENTARY

A. CHECKING WITH OTHER AUTHORITIES

1. U. S. DEPARTMENT OF LABOR

Figures of U. S. Department of Labor made public August 16, 1919, in an Associated Press Dispatch, show that the average general increase for the essential items of living costs, i. e., food, clothing, fuel, and shelter, advanced 80 per cent from December, 1914 to June, 1918. The dispatch referred to reads as follows:

> "Cost of living goes up 80 per cent since December, 1914. Washington, Aug. 16—General increases of about 80 per cent in the cost of living during the period from December, 1914 to June, 1919, were shown in tables made public here today by the department of labor. The tables were based on investigations in various representative cities over the country. In every instance, greatest increases were recorded in the prices of clothing and house furnishings. Food advances were of third importance. Figures for the period December, 1917, to June, 1919, show general average increases of about 20 per cent.
>
> Total increases in the two items of food and clothing, without considering other items in family budgets, showed enormous increases from December, 1914 to June, 1919; the advance in the case of Chicago being 157.07 per cent. The same items went up 125 per cent in Detroit, 125 per cent in Cleveland, 140 per cent in Buffalo, 103 per cent in Portland, Me., 137 per cent in Boston, 151 per cent in New York, 135 per cent in

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[1] Cf. Babcock's *Taylor System in Franklin Management.*

> Philadelphia, 128 per cent in Baltimore, 104 per cent in Norfolk, 146 per cent in Savannah, 139 per cent in Jacksonville, 93 per cent in Mobile, 135 per cent in Houston, Texas, 115 per cent in Portland, Ore., 110 per cent in Seattle, 123 per cent in Los Angeles, and 134 per cent in San Francisco and Oakland, Calif. Smaller increases in such things as housing, fuel and light, and miscellaneous items, lowered the general average increase, general percentage being as follows:
>
> Portland, Me., 74; Boston, 72; New York, 79; Philadelphia, 76; Baltimore, 83; Norfolk, 87; Savannah, 79; Jacksonville, 74; Mobile, 76; Houston, 80; Portland, Ore., 69; Seattle, 74; Los Angeles, 65; San Francisco and Oakland, 65; Chicago, 74; Detroit, 84; Cleveland, 77; and Buffalo, 84. In all instances the increase in clothing prices were greater than any other item.
>
> Percentages for the period December, 1917, to June, 1919, for the two items, food and clothing, for other cities show increases as follows:
>
> Atlanta, 40; Birmingham, Ala., 29; Cincinnati, 48; Denver, 53; Indianapolis, 40; Kansas City, 44; Memphis, 38; Minneapolis, 40; New Orleans, 48; Pittsburgh, 45; Richmond, 42; St. Louis, 39; and Scranton, 49. As in the case of the longer period, the general percentages were somewhat lowered by slighter increases in the cost of other necessaries.
>
> General increase percentages follow:
>
> Atlanta, 23; Birmingham, 19; Cincinnati, 21; Denver, 25; Indianapolis, 21; Kansas City, 20; Memphis, 23; Minneapolis, 18; New Orleans, 20; Pittsburgh, 21; Richmond, 20; St. Louis, 17; and Scranton, 25."

These figures were based on investigations made in various representative cities over the country.

Inasmuch as it is a fact that the increase from 1913 to 1914 was very slight, it will be noted that the Department of Labor's figure of 80 per cent from December, 1914 to June 1919 checks very closely with the Holt Manufacturing Company's figures of 81.6 per cent from January, 1913 to April, 1919; but this comparison is more coincident than designed because of various differences in the manner in which the Department of Labor compiles its data.

2. NATIONAL INDUSTRIAL CONFERENCE BOARD

A more truly comparative result is that obtained by the National Industrial Conference Board (Boston, Mass.) as shown in their cost of living supplement attached to issue of *Industrial News Survey* for August 4-11, 1919, Vol. III, No. 24. Therein it is stated, "The cost of living for American wage earners was 71 per cent higher in July, 1919 than at the outbreak of the world war in July, 1914."

> "The total increase for the five-year period since the beginning of the war, in the average cost of each of the principal items entering into the family budget was:

All items	70.8%
Food	85%
Shelter	28%
Clothing	100%
Fuel, Heat, and Light	57%
Sundries	63%

> Increases since March were as follows:

All items	5.9%
Food	5.7%
Shelter	4.9%
Clothing	10.5%
Fuel, Heat, and Light	No change
Sundries	5.%

> In combining these separate items to obtain the increase in the budget as a whole, account has been taken of the fact that approximately 43 per cent of the income of the average wage-earner's family is spent for food; 18 per cent for shelter; 13 per cent for clothing; 6 per cent for fuel, heat and light, and 20 per cent for sundries. This distribution is based on studies of the expenditures of a large number of families made by the United States Bureau of Labor statistics and other authoritative government and private agencies. The method of computing the change in the cost of living on the basis of the increases found for the separate items by the National Industrial Conference Board is shown below:

Budget items	Relative importance in family budget	Increase in cost between July, 1914 and July, 1919	Increase as related to total budget
All items	100.0%		70.8%
Food	43.1%	85%a	36.6%
Shelter	17.7%	28%	5.0%
Clothing	13.2%	100%	13.2%
Fuel, Heat, and Light	5.6%	57%	3.2%
Sundries	20.4%	63%	12.8%

> *a* Based on an increase of 84% up to June 15, 1919, as reported by the United States Bureau of Labor Statistics.
>
> The allocation of expenditures for the different budget items usually varies so little among the families of wage-earners that with any reasonable distribution there would be but slight deviation from the average increase of 71 per cent since 1914. This figure is, therefore, broadly representative of conditions the country over. But it should be emphasized that special local, racial, or other circumstances may at times make necessary some revision to adapt this estimate to meet specific conditions. This is especially true of rents, since changes in this item have at times differed considerably in separate communities. With the data given, however, such necessary adjustments may readily be computed.
>
> Estimates of changes in the cost of living made by the Board on the basis of retail prices and expenditures for the separate budget items by average families must not be confused with changes in wholesale price index numbers such as Bradstreet's, Dun's or those of the New York Times Annalist. Wholesale commodity prices do not necessarily change concurrently with retail prices and, as already pointed out by the Board they often tend to advance faster than retail quotations. Although valuable as an index of market conditions, commodity prices do not take account of the relative importance of the different items in the family budget. Likewise changes in retail prices of food should not be used as representing changes in the cost of living, since they measure but one item in the budget. *The only accurate measure of changes in the cost of living is that based on retail prices weighted according to the proportion of the total budget spent for each item by average families."*

Please note that the Board recognizes the wisdom of using prices weighted according to the proportion of the total budget spent for each item by average families. We believe that an even more accurate statement would have resulted from weighting the contributing elements in each of the major items.

3. *H. H. FRANKLIN MANUFACTURING COMPANY*[1]

Method

The two methods are identical in principle and in operation. The Holt studies are more comprehensive because of the Franklin experience, and therefore more accurate.

Attitude of Workers

When the cost of living research was first made at the Franklin plant (in 1916), the men had been working under scientific management for several years past, and were familiar with its operation. They were well acquainted with the personal attitude of the management, and no doubt had a relatively greater degree of confidence in the plan than did the Holt men.

Standards of Living

There are no great contrasts in food, clothing, etc. between the two localities. (Cf. *Industrial Management,* September, 1918, Vol. LVI, No. 3, page 185. "How to Determine Cost of Living in an Industrial Community," for details of Franklin studies.)

Wages

The average daily wages in the eastern plant were somewhat higher throughout, but there the work was paid for on the Halsey premium plan, all rates being set by time studies carried on in accord with true Taylor methods under the supervision of Dwight V. Merrick, whereas in the Holt plant the wages are strictly on a day rate basis.

Results

At the Holt Plant the reaction is identical with that obtained in the Franklin plant; and although the cost of living as a factor in wage adjustments was not introduced until a long time after the work of installing scientific management had begun at the Franklin plant, we have every reason to believe that it would have been received there at the start of the work as favorably as it has been received in the beginning of similar work at the Holt plant.

Conclusion

In view of the parallelism of the results in the two plants, under widely differing conditions of time and place, it appears that this is a sound basis on which to build up satisfactory industrial relations.

B. COMMENTS MADE BY WORKMEN UNDER HEADING "REMARKS"—TAKEN FROM QUESTIONNAIRE

1. "The way prices for food and clothing have advanced, it is impossible to save any money. In 1913 I was drawing $30.00 per week and living expenses and dry goods were less than one-half of what they now are." (*Foreman*)
2. "I have found out by experience that a man with a family, to meet his expenses through the high cost of things you eat and wear, it takes all you can make without losing any time, and then you are not able to dress the family the way you would like to." (*Machine Operator*)
3. "In my statement I have just completed, I wish to say I have made it out to the best of my ability, and wish to say further, that it takes some economy for a man to live as he would wish to live at my present salary under the pressure of the High Cost of Living." (*Laborer*)
4. "Am sorry to say I cannot live as I would like to."
5. "The present scale of wages paid to the factory man is quite insufficient to meet the present prices of food, clothing and doctor's fees."
6. "Having worked in the coal mine all my life until my health and eyes failed me, which forced me to quit the mines eight (8) months ago, I am now falling back in my savings, which was little enough to commence with. Not being married it is hard for me to understand how a married man with a family gets along and be honest. With the cost of living going higher,—having the interests of all men at heart, I believe that some provision ought to be made, which will make it more congenial for us all. And stop this continual agitation and unrest which really exists among all the laboring classes." (*Tractor Assembler*)
7. "Am pleased to give you as near I can a correct statement of my living expenses. It takes all my wages to live and keep my family. If it was not for my oldest son working steady and helping us out, am afraid we would go hungry sometimes. Am always ready to do anything in my power to do anything for the welfare of the Holt Manufacturing Company and its managers." (*Laborer*)
8. "From 1913 to 1919, I was able to buy 3 Liberty Bonds of $50.00 each but last November my family had the "Flu" and I lost three weeks, so you see what became of my three Liberty Bonds. I think 1913 was my best year since 1911, and everything has been getting worse since. Thanking you for your investigation." (*Blacksmith*)
9. "I find that the cost of living has more than doubled in the past five years." (*Machine Operator*)
10. "At the present rate of wages and the present cost of living, I can say that I am unable to make any progress preparing for old age, or betterment in the future. I am living up to the last cent, nothing to place in the bank after paying the butcher, baker and grocer, and installment on my home, and a small amount of life insurance. There is no such thing as progress under the present situation. The only pleasure we can indulge in is what is furnished by the Company." (*Laborer*)

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[1] A similar study was made at the H. H. Franklin Manufacturing Co., under the same supervision. Cf. Babcock's *The Taylor System in Franklin Management.*

11. "I consider 1916-1917 the most profitable years for me, but 1918-1919 has consumed a greater part of 1916-1917 savings." (*Pattern Maker*)
12. "Will say that by referring to grocery bills, three and four years ago, it averaged for each week about $4.00. Now it is about $10.00." (*Laborer*)
13. "Owing to the high cost during 1918 and clothing being so high, we just purchased what we absolutely had to have. I haven't as pleasant a house to live in now as I did in 1917, and are paying $30.00 per month now, and was paying $15.00 then." (*Store Keeper*)
14. "We cannot afford to buy butter at 65c per pound and have to live on butterine. Groceries in general are on the upward tendency. Working shirts in pre-war time were sold at 50c and are now $1.35. Clothing and shoes are greatly in advance. As a matter of fact, since peace has been declared there has been no lowering of prices." (*Laborer*)

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CORRESPONDENCE

SCIENTIFIC MANAGEMENT IN FRANCE

Translation of a letter from Henri Le Chatelier

Miribel les Echelles, Isère, August 11, 1919.

My dear Mr. Cooke:

Thank you very much for your pamphlet "An All-American Basis for Industry," which it has given me pleasure to receive. Your plan of an "Industrial Institute" is interesting, but it is nevertheless somewhat vague. In order to judge how it might work, further details and a more precise exposition are essential.

The brothers Michelin, who have a large plant manufacturing rubber products at Clermont-Ferrand, have just taken the initiative in an interesting enterprise. To promote the teaching of Taylor principles in our higher technical schools, they have made available a fund of 100,000 francs per year for the technical schools of the Ecole Polytechnique; that is, for the schools of mining engineering, roads and bridges, marine engineering, artillery, and of state manufactures; also 40,000 for the Ecole Central.

The application of these funds to these technical schools is made by the Société des Amis of the Ecole Polytechnique, in accordance with plans of a committee consisting of Mr. Charles Laurent, President, and Messrs. Michelin, Ferrand, President of The Normand Works and Chief Engineer of Naval Artillery, Bourgoin, Manager of the cannon works at Ruelle, Chappy, Production Manager of the works of the Société de Chatillon, Commentry and Neuves Maisons, and Mr. Le Chatelier. The secretaries are Mr. Nicholas, Assistant Engineer of Roads and Bridges, and Mr. Arène, Assistant Naval Engineer, attached to the steel works at Gurérigny.

Two amounts of 15,000 francs have already been allotted to the School of Mines and the School of Naval Engineering. They are used to defray the expenses of sending certain students to these schools, to provide prizes for the best studies of the Taylor system, to provide lectures on the subject and to procure for the libraries of these schools collections of books and pamphlets relating to the Taylor system. We expect requests for allotments from other schools.

Lectures have been delivered at the School of Mines by Mr. Nusbaumer, and at the Ecole Central by Mr. Victor Cambon. The opening lecture was given by Mr. André Michelin. At the School of Naval Engineering the lectures are to be given by the professor of administration, whose name I do not this moment recall. He expects in the near future to come to the United States to bring himself up to date in Taylor practice, and I shall take the liberty of recommending him to you.

You will be interested further in a series of noteworthy lectures before the Society for the Promotion of National Industry, by Messrs. Charpy, Compagnonx, Nusbaumer, Levéque, etc., on the contributions made by engineers during the war. They are being printed in the bulletin of that society (44 rue Rennes). These lectures, instead of indulging in generalities, presented concrete cases of successful practice. They had a great success and contributed to an expansion among us of confidence in your great compatriot.

Please accept, dear Mr. Cooke, the expression of my highest regards.

H. Le Chatelier.

ON MR. SCHULZE'S DEFINITIONS

Philadelphia, Pa.
Sept. 3, 1919.

To the Editor of the Bulletin:

Much unnecessary writing and some loose thinking will be avoided if we actively join in the discussion of the standardization of the terminology of management begun so ably by Mr. J. William Schulze in *Some Definitions* in the August issue. In his apparent conclusion as to the wisdom of dropping the word *executive* I fully concur. It has always seemed to me to resemble the word *worker* in its applicability to every one from the president who is the chief *executive* down to the office boy or the scrub-woman who likewise *execute,* even though their tasks be humble ones.

I am tempted to disagree with Mr. Schulze as to the wisdom of making the word *organization* include the plant, and other material things, such as forms and other mechanisms of management. To assume *plant* as a part of the *organization* would be like assuming that the carpenter and the machinist are nonexistant except as they are equipped with tools. This was the old conception of the mechanic. But we know now that the most proficient work can be done by mechanics who have tools supplied to them. Again it seems wise in all our thinking and doing to emphasize the importance of the human and intangible factors and to soft-pedal *things.* The latter have held the center of the stage too long.

Again I would not include in the *organization* all the personnel; only the "necessary human beings . . . brought together *in systematic and effective correlation.*" A man hired almost without conscious thought only to be dropped in an equally unconscious manner some time later cannot be considered as ever having really "belonged" to the living, sentient, effective entity which the word *organization* signifies to me. We must guard against being both too inclusive and too definite. To be carried on the pay-roll seems to afford a very superficial basis for being included in the *organization.* It is only as I am "systematically and effectively correlated" with the balance of the personnel "in the accomplishment of some desired object" that the validity of my claim to be a part of the *organization* becomes established. The same point comes up in the matter of the *plant.* If everything that a concern owns is to be considered *plant* the term loses much of its significance. Only such things as may fairly be considered as "used and useful" in the accomplishment of the "desired object" may rightly be considered *plant.* Buildings, machinery, etc., which are not "used and useful" may quite as easily be liabilities as assets. The chances are that an individual who has not been "systematically and effectively correlated" is not only not a part of the *organization* but leads his parasitic life entirely outside of it.

In executing any such commission as the one you assigned to Mr. Schulze one is necessarily confronted with two difficulties. In the first place there is every incentive to retain a nomenclature sanctioned by current usage rather than to suggest new terms no matter how appropriate the latter may be. A far more serious problem, however, is involved in our attitude towards the institutions, the practices, the procedures which we seek to define through the most appropriate terminology. The combination of these two difficulties does not, of course, make our task hopeless but should give us pause. While recognizing the importance of grappling with the problems involved we should be fully on notice that there are no easy solutions ahead.

Without attempting to go too much into detail at this time, I want to suggest that as the only technical society specializing in such matters, we cannot afford to take current institutions—industrial and otherwise—too much for granted as to the efficiency of their forms of organization. If this be our situation then, in desiring a nomenclature descriptive of what is, we must seek to have it one that can be readily adjusted and adapted to that which we believe is to be.

John H. Williams, a member of this Society, has said that any great enterprise comprises three stages: (a) seeing the vision (b) getting the direction and (c) taking the first step. Viewed from a somewhat different angle human undertakings seem to consist of: (a) ideas (b) the plans for carrying them out and (c) the execution of these plans. Any scheme for the organizing of industrial enterprises to be of continuing value must certainly take cognizance of such truth as underlies these two essentially equivalent statements. Therefore it seems clear that in the industry of the future we must have a place in the organization for those who will be *entirely* occupied with "spying out the land," with ideas rather than performances, and with the formulation of principles rather than in the accomplishment of results. We should constantly bear in mind that the introduction of imagination and the long look ahead into the affairs of men is one of the major tasks of our profession.

Hence I would suggest a revision, or rather amplification of Mr. Schulze's plan somewhat as follows:

SCHULZE	*REVISED*
	Direction
Administration	Administration
Management	Management
	Planning
Execution	Execution

The word *direction* (a function to be performed by directors) has little more to recommend it than the fact that it is used now to describe what is nominally the highest functions in the typical enterprises.

Of course I am here only recommending that a place be reserved for this function of *direction* "above" that of *administration* which latter function it seems to me Mr. Schulze has defined too broadly. I have quoted the word "above" to suggest that I have in mind a type of rank quite dissimilar to that used in military affairs.

Now in addition to the super-function of ideas it will be the duty of the directors—perhaps not constituted as they are today on a board—to outline in broad fashion the objectives of the concern. Under our present system the administrative officers not only lay down the objects but really direct the campaign for their accomplishment. Under this system too frequently whatever is accomplished—be it little or great—is made to appear as the whole of what was sought after. More and more we must demand that at every level in the organization the task be pre-determined so that the outcome—whether it be complete failure, partial failure, partial success or complete success—can be known of all men.

Therefore having in mind the scheme of organization, not only which is but which is to be, I believe that *Administration is the force which governs the object for which an organization is to strive, provides that type of management best adapted to the work in hand, and sets the broad policies under which it is to operate.*

Of course in smaller concerns it may be necessary to combine the functions of *direction* and *administration* and to entrust them to the same personnel just as sometimes happens in the case of functional foremen where the same man will perform the duties of more than one job. It is well in any such case, however, constantly to recognize the essential difference in the character of the several functions performed though they may be by the same individual.

The industrial world has been so intent for a generation past in searching out the technique connected with the tasks assigned to those we have called the "workers" that comparatively little attention has been paid to the technique of the jobs of the "higher ups." There are reasons for believing that part of the pressure for this inquiry into the nature of the jobs of directors, administrators and managers will come from the ranks of the "workers" themselves. It will be profitable if our Society can continue actively this discussion which Mr. Schulze has inaugurated.

Morris Llewellyn Cooke[1]

FUEL AND PRODUCTIVITY

An Open Letter

New York, July 28, 1919.

The Honorable Franklin K. Lane, Secretary of the Interior:

Under pressure of the war requirements for an increased national productivity, one of the chief handicaps encountered was the shortage of fuel, and that shortage of generating capacity was seen to jeopardize the uninterrupted power supply, means for securing which became of utmost importance.

Under stress of the urgency a bill was prepared giving to the President the authority to acquire control and operate the power industry of the country. The bill was based on the assumption that the private interests, in control of this industry, were short of adequate resources and saw no inducements sufficient to move them to undertake the successful mastering of the problem on a national scale. The authors of that bill were obviously influenced by the "Interim Report on Electric Power Supply in Great Britain" advocating super-power stations located at the collieries and producing simultaneously with electricity various by-products of coal.

While the exigencies of war time have now passed, the tasks of industrial development of the country and of sound solution of the labor problem are no less grave and pressing, and ~~both in~~ an increasing degree depend upon ample supply of cheap power. The production in the United States of coal, the source of power supply, is at present 144 million tons short of the domestic demand.

In this connection three factors deserve fullest consideration:

(1) Supply of ample and cheap power stimulates enterprise, and consequently provides employ-

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ment and reduces in a measure the cost of production of goods.

(2) The best cure for low wages is more motive power.

(3) Under the conditions prevailing in the power industry the waste of fuel is not only appalling, but what is worse, is made profitable at the expense of the people.

Whether the adoption in the main of the British plan of super-power stations at the collieries would produce equal satisfaction under American conditions —such as location of coal fields, water-power and industrial centers—is a question comparatively easy to verify by an impartial engineering research.

Private ownership is obviously incapable of producing electricity (simultaneously with coal by-products at the collieries) after the super-power station plan, and is not interested to do so as long as adequate profits may be secured in a cruder way involving relatively small investment, and the coal output bought at the mine in its raw state.

On the other hand it would be entirely feasible and most advantageous for the government to undertake such a super-power station enterprise. However, a number of years would have to be devoted to investigation, study, and preliminary work. Still further time would be required to put into operation such a system for the economic conversion of the main output of the country's coal into its various forms and uses.

How are the industries of this country to face the coal output shortage of 144 million tons (hard and soft coal), and a still further decrease in available fuel through demands from abroad for hundreds of millions of tons of coal?

Obviously the output must be increased to meet both domestic and foreign demand, or, at least, in order to avoid a grave industrial crisis, means must be found forthwith to make good the present domestic fuel deficit.

It has been variously estimated by power production engineers and the Fuel Administration that between 10 per cent and 25 per cent of steam coal is wasted under the boilers. It is the experience of this firm in power production work, that in no case has less than 12 per cent of coal been saved by more intelligent use of it, while in some instances the saving exceeded 40 per cent, without the use of any additional or improved equipment.

About 420 million tons of the 632 million tons annual requirement of hard and soft coal in the United States are used to generate power. Reckoning on the basis of a 12 per cent avoidable wastage, shown by experience in the boiler rooms to be the lowest average, gives a total minimum annual wastage of 50 million tons of steam coal.

This avoidable wastage of 50 million tons represents about 36 per cent of the present coal shortage.

Otherwise said, recorded actual experience shows that the enormous amount of 36 per cent of the present coal shortage is due to entirely avoidable waste and can be made good by the simple process of employing proper methods of using the coal in the production of power with existing equipment.

Some idea of the loss which this avoidable wastage imposes on the Nation—in addition to the power supply loss—can be gathered when it is remembered that the mining of this 50 million tons of wastage employs uselessly the labor of about 170,000 coal miners, and the haulage five million car-miles, in addition to a large amount of other labor and material required in connection with the mining, transportation, maintenance and replacement of equipment employed in this unproductive production.

The further great values to the nation which go up in smoke with this wanton waste are seen from a computation of all the useful elements that are extractable from bituminous coal:

In 1918 a ton of bituminous coal was sold at the mine for $1.32, yet the multiple products of the same ton of coal would have had a collective value of at least $16.

In terms of cash, the price value of the 50 million tons of coal wasted yearly in power production alone— not taking into account large tonnages wasted in connection with other uses—was 65 million dollars at the colliery, while the value of the multiple products of this coal would have been over 800 million dollars.

In terms of social value, the same coal wastage represents a loss of 500,000 tons of ammonium sulphate, 100 million gallons of benzol, 400 million of tar. Transferring these amounts into other value, we find the nitrogen contained in 500,000 tons of ammonium sulphate is capable of raising the production of wheat 45,316,000 bushels, based on 115 lbs. of nitrogen to the acre. Benzol is an equivalent to gasoline and the above amount is valued at about 30 million dollars, capable of accomplishing an enormous amount of mileage of trucking and travelling. The 400 million gallons of tar would make possible the extension of rural highways and keep the present roads in good condition. The above three examples concern only the primary products while other chemicals, drugs, dye-stuffs, etc. could further be extracted.

The gravity of this situation and public responsibility in the matter will only be met when the facts become generally known and appreciated. Already a certain number of progressive concerns, employing expert advice and organizing their power production along more intelligent lines, are eliminating this wanton waste.

One of the reasons why the general and immediate enforcement of so obviously urgent an economy lags, is to be found in certain aspects of the present system of financing industrial corporations. Paradoxical as it may appear, it is nevertheless often true that a private company wasting fuel does not suffer appreciable loss thereby, and succeeds not only in transferring the expense of such waste to the public, but moreover, often charges the same public with the interest thereon. To illustrate without being specific, many public utilities companies petition the public service commissions to permit the advance of rates for electricity or fares. The public service commissions, in granting such petitions, act on the presumption that the efficiency of plant operation in the plant concerned is as high as the state of the art permits, which, in point of fact, is far from being the case.

In view of the fuel famine which the country is facing, according to all indications including the present coal shortage of 144 million tons, and the general industrial and labor crisis sure to result therefrom, and speaking from constant practical contact with the power problem, *we respectfully beg to submit* for the consideration of *The Secretary of the Interior,* the following *suggestions* of alternative methods of amelioration that could be employed without delay pending, and preliminary to, the more radical measures which the Secretary of the Interior is evidently laboring to bring about, but the installment of which will require considerable time:—

(A) Either by supplementing the present powers of every public utility commission, or by creating a federal power commission, to provide the necessary authority and means for determining by experiment and research the maximum allotment of fuel per unit of electrical output or per minimum thermal efficiency, in regard to each individual plant. Data so ascertained is to be used as a basis for the determination of the maximum charge permissible for the electric current generated in each plant. Such a course will render unprofitable the toleration of preventable wastes, and the whole mountain of present public loss included in that avoidable waste. Incidentally, it will also tend to lower the cost of electric power.

The electrical authorities should require, as a means of keeping in touch with actual progress of the elimination of this waste, a simple chart—to be kept and reported weekly or monthly to the power bureau—showing on a percentage scale the relations between the coal consumed and that allotted.

(B) Or the Nation may take over the management, operation and distribution of electrical power supply, beginning gradually with the largest establishments, securing the holders of all stocks, debentures, bonds, etc. of such public utility corporations by means of a single bond issue with fixed interest. The officials of the managing power commissions—operating the plants—to be appointed; one-fourth by the government, one-fourth by labor, and the remaining one-half by the recognized national engineering societies;

(C) Or, as in the case of minors, incompetents or wastrels, the power plants under incompetent management and wasteful operation should be placed by courts of justice or public service commissions under the trusteeship or guardianship of competent management engineers associated with representatives of the Government and of Labor.

It is pointed out that the operation of any of the above alternatives does not call for the installation of any added machinery or other plant equipment,—a not unimportant consideration.

WALTER N. POLAKOV[1]

EXCERPTS

ONLY a little while back the workers could conscientiously, and actually did, hold back on production. "Soldiering" on an essentially international basis was practiced pending the time when labor could measurably control the division of the proceeds of a more efficient industry. But the balance as between the employers of the world and their employes which has resulted from the war has so altered this situation that in every direction we see indication that the workers of the world—organized or unorganized—are coming to feel some measure of responsibility for production and are manifesting an increasing interest in the principles and mechanisms through which production may be increased. We need constantly to remind ourselves, however, that the employing class has been guilty of many varieties of sabotage as, for instance, when consciously placing in executive positions those not fitted properly to carry on their functions. If the employers under the new dispensation are to have a right to call on their employes for full performance, the latter certainly have the right to demand competent leadership. The day does not appear to be far distant when this right will be exerted. (Morris L. Cooke in *The Annals,* No. 174, p. vi).

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[1] Consulting Engineer, New York.

A STRONG argument in favor of opening an employer's accounts to his employes is that through knowledge of the accounts employes gradually learn that new capital is frequently needed, and that in most businesses money has to be borrowed at some peak of business; so that the employer must have credit at the places where money can be borrowed. A curious illustration of this point came to light this Summer in a canning establishment in the Middle West, which has a strong peak lasting from three to four months. The business is really managed by a mixed committee containing manager, directors, and foremen or heads of departments, all of whom are profit-sharers. The company is new, and has no credit as such, the borrowing power lying with the manager. Knowing that a considerable sum of money would have to be borrowed in order to carry on the business during the peak, the managing committee insisted that the life of the manager should be insured for an amount which would cover the habitual borrowings of the peak. The managing committee took this action because it wanted to be sure of the money necessary to carry on the business, in case the manager should die before or during the peak. These profit-sharers had learned in a few months much about the proper coöperation between capital and labor, although the plan of profit-sharing under which they were working was a defective one. (Dr. Charles W. Eliot in *The New York Times,* Sept. 21, 1919).

ANY kind of profit-sharing will succeed which appeals to the fundamental motives that have for centuries past induced men, rising out of barbarism, to be industrial and frugal, and to keep their promises and contracts. These motives are love of home and its surroundings, and of parents and brothers and sisters in the first home of wife and children in the second, the desire to have steady employment and to accumulate property for the sake of home and descendants, and the hope of freedom from the dread of disabling sickness or accident, or premature death, and a forlorn old age. Free Governments give these motives play, and a democratic administration of business will do the same. Genuine partnership between labor and capital will develop and satisfy these motive powers in both the partners, because every good profit-sharing scheme turns out to be for the advantage of both parties. . . . It follows from these considerations that a democratic organization of industries need not be dreaded by anybody, provided that the human motives for steady, faithful work, for habits of saving and accumulating, and for unselfishness in individuals, families and classes be not only preserved, but reinforced. Whatever doctrine impairs these motives, like socialism, drawing-room or Bolshevistic, or the labor-union teachings which would bring about diminished productiveness, is to be dreaded and resisted by lovers of liberty and justice for mankind. (Dr. Charles W. Eliot in *The New York Times,* Sept. 21, 1919).

MEN are of two broad types, namely: the engineering type and the executive type.

The engineering type of man works for the solution of a single technical or engineering problem and is concerned with the determination of the solution rather than the application of that solution to practical activities. The true type has the capacity to concentrate continuously on a single problem until the solution has been reached. He is interested in the determination of cause and effect and of the laws that govern phenomena. He is disposed to be logical, analytical, studious, synthetical and to have an investigating turn of mind. The predominating characteristic that distinguishes him from the executive is his ability to concentrate on one problem to the exclusion of others for a protracted period, to become absorbed in that problem and to free his mind of the cares of other problems. He does not submit readily to the routine performance of a given quantity of work. He deals with laws and abstract facts. He works from text-books and original sources of information. Such men are Edison, Steinmetz, the Wright brothers, Curtiss, Bell, Pupine, Fessenden, Browning. These men are the extreme of the engineering type, they have enormous imagination, initiative, constructive powers. Mr. Taylor was in reality an engineer rather than an executive. He applied his wonderful inventive genius to the invention of management methods.

The executive type takes the conclusions of the engineer and the laws developed by the engineer and applies them to the multitude of practical problems that come before him. His chief characteristic is that he works with a multitude of constantly changing problems at one time. He concentrates on one problem after another in rapid succession. In many instances he has not the time to obtain all the facts and he must arrive at a conclusion or make a decision based upon partial knowledge. He must rapidly assimilate available facts and fill in what is lacking from the ripeness of his own experience, frequently calling upon his powers of judgment, and even of intuition. He is a man of action, boldness, ingenuity, force, determination, aggressiveness, courage, decision; he is possessed with the desire to get things done, impatient of delay. He works from a handbook, a newspaper, or nothing at all. Such men are Schwab, Goethals, Pershing, Farrell, Hindenburg, Hoover.

We frequently find that the leaders of either of these classifications possess something of the qualities of both and therefore we have executive engineers and engineering executives. The combination of a high order of ability in these two classes in a single individual is rare and valuable. (J. E. Otterson, President Winchester Repeating Arms Co., in *The Annals,* No. 174, p. 91).

THE broad functions of planning and production are generally recognized. Planning is the determination of what is to be done. For this purpose a planner should be analytical, have reasoning power, imagination, be able to dissect, to break the task down into its elements. He should be synthetical, that is he should have the power to draw these elements together, to build up and to construct the whole out of its elements. Production is the application of force through the plan. A productionist should be forceful, aggressive, driving, tenacious, persistent, able to control men, to direct them, to guide and to lead them.

Psychologically, these correspond to the engineer and the executive, and the fault most commonly found in modern organizations of a low order of efficiency is that they neglect the planning or engineering function; and the fault most commonly found in modern organizations of the so-called systemized kind is that the planning function has been too much elaborated and the production function too much subordinated.

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Different emphasis will require to be placed upon the various functions under different sets of conditions; in one instance the planning function will require to be emphasized and in another the production function. For example, in a jobbing shop where each job differs from others it is necessary to pay particular attention to the work of planning, to study it with the best talent available and to record the results of such study in the form of instruction to producers. In this manner the work of production will be standardized, controlled and simplified and the work of planning will produce its own reward.

On the other hand, in a manufacturing shop where work is of a highly repetitive character and a large volume of similar articles flow in a stream the work of planning becomes standardized, growing out of the original engineering plan, and men can be selected and assigned to it accordingly. In such a situation, emphasis will require to be laid upon the production function in order that the continuous flow and the volumn of production may be maintained, and the one selected for such a task should have the psychological characteristics of the typical productionist. (J. E. Otterson, President Winchester Repeating Arms Co., in *The Annals,* No. 174, p. 96).

REVIEWS

Office Administration. By J. William Schulze, B.C.S., C.P.A. (New York: McGraw-Hill. 1919. pp. xiii, 295.)

This book, by the author of *The American Office,* should prove suggestive for the average office manager. It is a collection of many of the ideas and devices which are now in use. The author is conservative, and goes into considerable detail for the benefit of those who are not accustomed to thinking and planning their work along modern lines. It is primarily a reference book of accepted usage and as such it has merit, but there are in it few if any original contributions to office management.

From the technical point of view its weakness lies in the fact that the author considers the management of an office as a thing in itself quite distinct from management in general. It is true that he refers to the similarity between the principles of organizing a factory and the principles of organizing an office. But in general the tendency is to consider the management of an office as a distinct and separate achievement, to be worked out quite by itself.

There is also a tendency to deal with the separate features as such, rather than as a part of the whole. The better class of management engineers are increasingly refusing to devise and install methods for a single department or feature of a business. Experience has shown that separate units of method are seldom successful in themselves, even if maintained, and that unless tied in to the methods as a whole, are more than apt to disintegrate.

John H. Williams.[1]

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ON THE PRACTICE OF ENGINEERING

It is doubtful whether engineering has been practiced as a profession to a point where definite codes of ethics and cannons of practice are possible. Certainly management engineering as a branch of engineering practice has not. In the effort to supply what may be looked upon as an interim standard, the Board of Directors has approved the following statement in spirit, pending a time when there can be presented to the Society an adequate code born of our own experience.

A MANAGEMENT ENGINEERS' CREED

The sublimest duty of the engineer is to keep the faith:

The faith of the client that he will not undertake what he knows to be beyond his ability, and that with respect to what he undertakes he will give conscientious service to the limit of his ability;

The faith of his fellow engineers that he will remain true to his science and will magnify and not cheapen it; and that he will base his efforts for public recognition upon ability, scientific attainment and actual performance, and not upon ambiguous self-laudation;

The faith of the community that he will undertake no service inconsistent with the public welfare; and that in service consistent with the public welfare, but in which the interests of groups appear to come in conflict, he will judge carefully and sympathetically the claims of rival interests, and attempt to establish that unity of purpose which promotes the public welfare.